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Secretary of the Smithsonian Institution.

WASHINGTON, D. C., *October 8, 1894.*

CONTRIBUTIONS TOWARD A MONOGRAPH

OF

THE INSECTS OF THE LEPIDOPTEROUS FAMILY NOCTUIDÆ

OF

BOREAL NORTH AMERICA.

A REVISION OF THE DELTOID MOTHS.

BY

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CONTRIBUTIONS TOWARD A MONOGRAPH OF THE INSECTS OF THE LEPIDOPTEROUS FAMILY NOCTUIDÆ OF BOREAL NORTH AMERICA.

A REVISION OF THE DELTOID MOTHS.

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Professor of Entomology in Rutgers College.

Under the general term "Deltoids" there are usually grouped in lists, catalogues, and collections the moths of a series of species and genera which have a somewhat distinctive appearance and habitus, but for which we have as yet no exclusive characters.

This series has been elevated to family rank, has been associated with the Pyralids, and has been most recently recognized as indistinguishable in structural characters from the Noctuidæ. It is possible that subfamily rank at least should be accorded the series as here restricted; but this is not proposed at present, since within the limits of the series there are two if not three very distinct types or tribes, of which *Helia*, *Herminia*, and *Hypena* are, respectively, typical.

In a general way the species are characterized by unusually long palpi, which are either slender, closely scaled and curved upward and backward, sickle-like, often far exceeding the head, or they are directed forward obliquely or straight, clothed with upright scales, the second joint longest, the third always set into the second so as to point upward. In the latter case the palpi with the pointed frontal tuft form a beak or snout similar to that in the Crambidae among the Pyralids. These elongated palpi are not peculiar to this family among the Noctuids; but there are very few genera so constructed in other series, and these may be, in most cases, differentiated without trouble. Among the species in which the palpi form a snout, being oblique or straight, with elongated second joint, none are Deltoids that have the terminal joint drooping or set in at a downward angle with the second joint. Nor do I include any species in which the second joint is closely scaled above, the long vestiture directed downward, so that the apparent enlargement of the joint is formed by scales directed and extending below the joint. This at first seems a slight character; but it will assume importance when the character of the palpi is closely studied, and when we consider that it is really reversing the position of a joint. Of the forms

in which the palpi are slender, curving upward and exceeding the head, none are Deltoids in which the two pairs of wings are similar in size and maculation or have a geometriform ornamentation extending on both wings. Further, with the exception of *Helia*, all Deltoids with palpi of the character last described have the fore legs of the male modified, clothed with tufts or pencils of hair, and always with aborted tibia.

With the exceptions stated, the series does not differ from other Noctuids in any essential features; yet it will be worth while to mention some of the other main characters. The head is always small, yet never retracted, and often prominent. In none of our species is the tongue aborted or even weak, so all of them are capable of feeding. The eyes are usually prominent, semiglobose, though never very large; always naked, though in some genera—only one in our fauna—fringed with hairy lashes. Ocelli are present in all our forms, situated close to the compound eye, but distinctly variable in their position relative to the posterior margin of the eye. In the Herminiini they are almost as far back as possible, while in Hypenini they are almost in the middle of the crown. The point of insertion of the antennæ varies somewhat; but as in the matter of the ocelli our material is not yet sufficient to enable us to make studies on all the points involved or to generalize. The structure of the antennæ is exceedingly interesting from the character of the sexual modifications; but this subject will be taken up again further on, and I need only say that they vary from simple to lengthily pectinated.

The character of the palpi has been already referred to.

The body is slight in most instances, never very robust. The thorax is closely scaled in general, tufted only in the Hypenini, where a robust structure is characteristic of the males. The abdomen is usually cylindric, without sexual differences, but in the female terminating in an abrupt point, while in the male it is truncated. While it is never short, the abdomen rarely exceeds the anal angle of the secondaries more than a little, and it as rarely fails to reach that point. Tuftings are only found in the Hypenini, where, in most of the species, there is a series of little round, truncated, dorsal tufts, composed of upright scales and very easily rubbed off.

The legs are usually long and slender, though hardly weak. The thoracic structure tends to an elongation of the parts, the coxæ being in all cases well developed. The fore legs are short, the tibiæ usually short in comparison with the femur; but in the males of the Herminiini the modifications are very curious and will be again referred to. The middle and posterior legs are longer, more as in the Pyralids, with extremely long and unequal tibial spurs, terminal on the median, terminal and at apical third on the posterior pair. The legs are closely scaled as a rule, but in some of the male Hypenini they, as well as the entire thoracic parts, become hairy or even woolly.

The wings are usually large, but rarely frail, the two pairs proportionate, or the posterior enlarging at the expense of the anterior, as in the typical *Hypocia*. We have a predominance of pale yellowish or luteous tints in the Herminini, and of dark or dull brown hues, sometimes with contrasting whites, and with a tendency to elevated black scales in the Hypenini. The ornamentation is usually simple, frequently consisting only of single transverse lines over a uniform base; but in some species variation apparently runs riot. The secondaries are always simply marked, usually nearly immaculate or with a vague median and extra median line, never with any striking ornamentation or with a continuation of that of the primaries. The venation is normal in most instances; that is to say, in the primaries the accessory cell is present, vein 5 is part of the series from the end of the median vein, and there is a single internal vein, which is not, or but feebly, forked at base—a character of no real value to define a Noctuid. In the secondaries, vein 5 is as strong or scarcely weaker than the others, and joins the median vein by an abrupt curve or bend a little before the forking of 3 and 4.

No distinct cross vein is present in any species examined by me, and in all cases the origin of 5 is from the median without a break in the continuance of the vein. In the Herminini there is a strong tendency to a loss of the accessory cell, and this increases in the aberrant forms, in which the wings are angulated, which lack it as a rule. This is accompanied by a variation in the arrangement of the subcostal series of veins, and we may have 6, a stalk bearing 7, 8, and 9, and 10 from practically the same point at the end of the subcostal, or 10 may arise from the stalk bearing 7 to 9, while in rare instances 10 arises more basally and from the subcostal before the end. These variations are usually of generic value; but they must be cautiously used, for occasionally the accessory cell may be present or absent within the limits of the same genus.

I have excluded from this series the genera *Pseudorgyia* and *Rivula*. *Pseudorgyia*, in my opinion, has no real Deltoid affinities. The snout-like palpi and the pectinated male antennæ are the only features that can be relied upon; but those same characters occur in the little aberrant series of which *Phiprosopus* and *Eucalyptera* form a part, and the antennæ of the former and palpi of the latter mark the sum of the Deltoid characters. The palpi have the last joint drooping, and the enlargement of the second joint is by downward vestiture, exactly as in others of the series referred to.

Rivula is more difficult to deal with, because of its venation. It lacks the accessory cell, and vein 10 of the primaries arises from the subcostal precisely as in some of the true Deltoid genera; but on the other hand vein 5 of the secondaries is decidedly weak and is lost basally in the texture of the wing or arises from a cross vein so weak that no trace of it remains in the mounted wing, and that quite near to the middle of the cell, though nearer to 4 than to 6, thus differing from all the others referred to this group, and agreeing with the char-

acters of the Trifida. The palpi also agree with the series of which *Amolita*, *Cilla*, and *Eucalyptera* form a part, and there its relatives must be sought. Finally the early stages are aberrant. The larva, according to Guenée, lives on low plants in moist localities; has sixteen feet, resembles those of *Pterophora* in appearance, has a large, flattened head, is sluggish and when transforming into a pupa fastens itself by the cremaster as well as a girth in a horizontal position. This pupa has an obtuse head case with two distant tubercles, above each of which are two diverging bristles. None of these characteristics are Deltoid, and for the reasons given I do not include the genus here. It may be stated that Herrich-Schäffer classed it with his Nycteolidæ, which may not have been such a huge blunder as has been thought.

I have mentioned two tribes in the previous pages, the Herminiini and the Hypenini; but there is really another which contains in our fauna a single genus only—the Heliini, all referable to the genus *Epizeuxis*.

The Heliini are characterized by smoothly clothed palpi, curved upward close to the front, reaching to or considerably exceeding the vertex. The antennæ in the male are laterally ciliated, without special modification or nodosity, and the fore legs in the male are peculiar in that the femur is unusually long, dilated at base, and excavated inferiorly toward the apex to receive the tibia, which is short and without special modification. The wings are of good size, subparallel or with a slightly oblique outer margin, so that the costal and inner margin are of nearly equal length. I have not been able to make out any specialized sensory structures in the femoral excavation. This tribe is the least specialized of the Deltoid group.

The Herminiini offer more decided characters, chiefly in the male, in palpi, antennæ, feet, and wing form. The palpi may be slender, smoothly scaled, recurved; or they may be compressed, with upright vestiture, and then either oblique or straight, the middle joint always longest, and the upright vestiture either massed toward the tip or even throughout. In the male the palpi are frequently shorter, and are oblique when they are straight in the female. In one case only, *Palthis*, we have at the tip of the third joint a membranous extension, forming a cover in which lies a pencil of long, yellow, hair-like scales, which is capable of expansion at the will of the insect. A more particular description of these pencils is given later on, but they are in all essential features like those on the fore legs of other genera, and there are the same large sensory pits that are found elsewhere in association with these tuftings or pencils.

The antennæ in the Herminiini are always distinguished in some way in the male. In the tribe as a whole the front of the head is quite wide, and the antennal foveæ are situated well up on the vertex, close to the compound eye, thus well separated at base. In their simplest structure they have the joints with moderate lateral bristles,

but accompanied also in every case with little tufts of cilia arising from small tubercles set into sensory pits of the most diverse character and varying greatly in number. Often the joints are clothed with scales which are somewhat elevated at tip and so arranged as to make them seem serrated or marked at the edges, an appearance not borne out by the joints themselves when denuded. The bristles become gradually longer, and are then reinforced by small processes or teeth which are pitted and give rise to sensory hairs. Usually there are tubercles also, or little pegs set in large pits, and from these arise single hairs or little tufts. The bristles gradually change to pectinations, long or short, never more than one to each side of each joint, and these in turn are furnished with lateral ciliations, regular or irregular. Sometimes there is a stout bristle inserted near the tip of the pectination, in a deep pit, a little protuberance on the branch giving additional support. There is also considerable variation in the length of the pectinations, and as they increase in length they usually become less robust. Where they are short and stout additional tubercles or pits with tufts or single hairs become more numerous.

In addition to these normal structures of the antennæ there are others that are decidedly unusual, always placed at about one-third from the base. This abnormality may consist of a mere thickening of the scaly clothing, the individual scales becoming larger in every direction, and they may or may not cover a slightly enlarged joint or two. Sometimes beneath the tuft of scales one, two, or three joints will have, in lieu of ordinary pectinations, stout, short, pointed, straight or curved, brown, corneous processes, two of which are usually contiguous at tip, so as to seem under a low-power hand lens the point of a single process. Where such processes occur the joints are often considerably broader and shorter and sometimes have numerous pittings with or without bristles, hairs, or pegs. In such cases, also, the pectinations or lateral processes of the antennæ are wanting, or at least much abbreviated, on the inner side from the base to this specialization. These processes attain their maximum development in *Zanclognatha*, and are always associated with a pectinated or strongly bristled antenna, and with strongly tufted anterior legs. Associated also with the modifications of the joints there is a greater or less marked change in the continuity of the antenna as a whole, sometimes amounting to a distinct curve.

In *Tetanolita* we have a distinct departure in a different direction in the form of a pointed tuft of hair on the inner side, covering no special modification save two slightly enlarged joints. In *Reulia* the modification has assumed more definite form, and the tuft becomes quite prominent. We notice also that the antennæ are more slender beyond the tuft, that there is a tendency to curl, and that there seems to have been quite a definite change in structure at the point covered by the tuft. After proper preparation for study under the microscope this is seen to be the fact, one of the joints being much elongated and also

much curved, forming a very distinct "scoop-out." Opposed to this is a movable finger-like process, with hooked bristles at its tip, supplemented by two or even three other less specialized processes.

What is the purpose of all these specializations, and why have they been developed?

To the latter part of the question I have no answer, save as the structures are sensory in character. It is usually conceded that the olfactory organs and the sense of smell are situated in the antennæ, and that the development of pectinations and sensory hairs is necessary to enable the male to find the female more readily. This explanation may be considered as correct, but it gives no reason why so simple a structure answers the purpose in the one case and why so extremely complicated an apparatus should be required in the other. The sense of touch is also placed in the antennæ by students, and also without doubt, so far as I am concerned, correctly. I would, however, in cases of this character consider it rather a sense of appreciation than a sense of touch, and possibly this sense of appreciation may cover those of touch and hearing, being reduced to an appreciation of certain disturbances in the atmosphere acting upon the extremely sensitive hair, which communicate, directly or indirectly, with nerve fibers. That they are not required by the species to maintain its existence is proved, of course, by the fact that the female has no such sensitive or sensory structures, and hence we assume that they are of use in recognizing the presence of that sex by the male.

The other processes stand on a different footing. They are mechanical, not sensory in their character, and we assume that they have a sexual function for the reason above given—they are found in one sex only. I have never myself seen any species of this series in copulation, nor have I found any who have seen it. So far as I am aware, no publication to which I have had access has described the process; hence the subject is one for conjecture. Judging from what we know of certain species of Coleoptera these mechanical modifications are clasping organs, enabling the male to encircle and tightly hold the female antennæ during copulation. Why the necessity for such organs exists in the present series still remains a question.

The most interesting modifications, however, are those of the male forelegs, and in this entire tribe not a single species has a quite normal structure of this member. Irrespective of all tuftings, the proportion of the parts becomes changed.

The coxa, usually not mobile but rigidly applied to the thoracic mass, becomes movable, loses rigidity, and gradually becomes elongated and attenuated, forming a functional part of the leg.

The trochanter, which is inconspicuous normally, tends to increase in length until it exceeds the femur in size in every dimension, giving us a very distinct additional member in the leg structure. No specializations of a sensory character are developed on this segment so far as our species are concerned.

The femur tends to an increase of size and weight in one group of species and in the opposite direction in others, its decrease usually corresponding to an increased length of trochanter. Sometimes there is an enlargement toward the apex, and quite usually the member is a mere shell, adapted to accommodate and conceal a pencil of hair or a mass of specialized scales. Occasionally there will be found on the under side an area of specialized pits somewhat protuberant or raised above the surrounding level, forming, apparently, an extremely sensitive surface.

The tibial modifications are yet more radical. The member itself is shortened, sometimes so much as to make it a mere rudiment; but it always is of sufficient size to bear a relatively large epiphysis, and an altogether disproportionate appendage which seems a continuation of the outer wall and extends to the tip of the first tarsal joint if it does not include the entire tarsus. This appendage is sometimes quite slender, sometimes enormously expanded and shield-like, and usually covers a mass of specialized scales and, very frequently also, tufts or pencils of hair. It is often clothed with stiff hair outwardly, and when cut or crushed is found to have the inner surface a mass of specialized sensory pits. The epiphysis is always present and relatively large. In many cases the covering is furnished at the edges with curved hooklets, which are closely set and fit into corresponding foveae on the tibia.

The tarsi are variously modified. In all cases the first joint is enormously elongated, often equaling the femur, and it is also much thickened. This thickening is more apparent than real, however, for in most cases the outer edge of the joint is so deeply excavated that it is a mere shell. Occasionally there will be found near the tip a ladle-shaped appendage, attached by the handle, the bowl directed toward base, and the edges of this bowl furnished with hooklets. This seems to be applied to some point in the tibial process; but exactly what purpose it serves I have not been able to ascertain. The other tarsal joints are normal as a rule; but not infrequently they are much shortened and partially aborted, the terminal article sometimes bulbous and with hugely developed claws. So greatly elongated are the legs as a whole that when turned back they extend far behind the anal angle of the secondaries and almost as far as the tips of the posterior legs.

Specialized appendages in the form of scales and tufts or pencils of hair have been mentioned and merit close study. The coxa is usually hollowed out on its anterior face, and in the cavity are inserted long, yellow or blackish hair-like scales, those near the base longest, gradually decreasing in length, so the entire mass may lie fully extended when at rest. When the leg is extended this mass of hair may be expanded somewhat fan-like. When at rest the femur covers this coxal excavation and both conceals and protects the tufting, now neatly folded away. At first sight this and similar pencils appear to consist of fine silky hair; but under the microscope it is found that there are

really greatly elongated scales, the shank being a very attenuated cylinder, while the tip is sometimes dilated, club like, and sometimes fan-like, but never very much enlarged. The shorter they become the more distinct is the scaly character of these pencils; but for convenience and as expressive of their actual appearance they will be referred to as tufts or pencils of hair.

The femur in this tribe is quite usually supplied with a pencil of long hair, attached to the upper side near the tip and lying in a groove which includes nearly all there is of the femur. In length this pencil equals the trochanter and femur combined, and when at rest it folds back, the femur is applied to the coxa, and the groove is thus closed. By this application of the femoral groove to the groove in the coxa the pencils of hair on these parts lie together in what is then a closed cylinder or elongated capsule. When the leg is extended the femoral pencil may be erected and expanded fan-like, forming in many cases more than three-fourths of a complete disk. The tibial process quite frequently covers another pencil of similar hair which, while it may be dilated, spreads out loosely in all directions and not fan like. Quite usually, when no distinct pencil of hair is present, the process covers a loose mass of specialized shorter scales, while huge scales fringe the edges of the process. The latter folds around the elongated first tarsal joint, which is often grooved to conceal or protect the tibial tuft. No tufts of hair or scales are on the tarsi.

A specimen with its fore legs extended and all the pencils of hair expanded is a curious and interesting sight. *Zanclognatha larigata* and *Chytolita morbidalis*, both common species, have these tuftings well developed.

What purpose do these structures serve? That they are sensory is reasonably certain, from the facts that they are connected with specialized pittings and are so carefully provided with protective coverings when not in actual use. In my earlier writings I called them "scent organs," following those German authors who consider them "Duft apparatus." The suggestion is, that certain glands connected with these pencils secrete some substance which is odorous and which through the pittings or pores of the integument bring their secretions into contact with the pencils of hair, by means of which the odor is gradually diffused. That this odor is connected with the sexual function is universally assumed; but just how, is not so clear. It can not be that the odor is meant to attract the female, for the attraction is the other way, and the male seeks out the opposite sex. If the tufts came into play in courting it would seem as though there should be some corresponding organ for the appreciations of the odors in the female; but I have entirely failed to find any such. In actual copulation there seems no function that could be filled by these structures. They must be, for the present, classed among those appendages with the use of which we are not fully acquainted. It is indeed remarkable that

throughout this tribe antennal developments and leg structures should be closely correlated; for with the most liberally tufted legs are associated the antennae with the longest pectinations or bristles and the most highly developed appreciative organs.

The genera in this tribe are quite numerous, and divide readily into two series, in one of which the palpi are slender, closely scaled, upcurved, and often recurved, the second joint never straight or with upright vestiture forming a blade-like structure. In the other the palpi are straight or oblique, never recurved, the second joint always with upright scales, forming a compressed more or less blade-like structure; the latter series in this particular agrees with *Hypena*, while the former agrees with *Helia*.

Among the genera with slender palpi *Zaucloquatha* and *Hormisa* have at the basal third of the male antennae two or three joints furnished with stout corneous processes and an outer thickening of scales. *Zaucloquatha* has the male antennae with long lateral bristles, while in *Hormisa* there are long pectinations. These genera are well associated and are conveniently placed at the head of the series. In both, the tuftings of the fore legs of the male are well developed, reaching their extreme in some species of *Hormisa*.

Tetanolita has the male antennae laterally bristled, and at basal third there is a pointed tuft of hair, very similar to that of *Renia*, but it does not cover any special modification except a slightly enlarged joint or two. The tuftings of the male fore legs are moderately well developed. This genus, containing small species, shows marked relationship to *Bleptina* and *Renia*, and its natural position is between these genera and not immediately following *Hormisa*, where convenience of analysis has placed it.

Bleptina has the antennae laterally bristled in the male, without special modification of any kind at basal third. The tufting of the male fore legs is much reduced. Unlike all the other genera with which it is associated it has narrow, elongate, and pointed wings. The palpi are transversely flattened, but are curved and do not have prominent upright scales. It forms a connecting link to the second series, and is allied to *Renia*.

In the series in which the palpi are straight or oblique and blade-like, with upright scales, some differences in venation and wing form occur.

The accessory cell is present, and the venation is quite normal in *Philometra*, *Chytolita*, *Hypenula*, and *Dereetis*. It is absent and the venation is abnormal in *Renia*, *Heterogramma*, *Gaberasa*, and *Palthis*.

Philometra has lengthily bipectinated male antennae, without special modification or nodosity at basal third. The tuftings on the fore legs are very strongly marked, resembling *Hormisa* in these characters, as in the antennae. Its natural position is immediately after *Hormisa*, from which it differs in palpal structure as well as in the lack of special antennal modification.

Chytolita has the male antennæ bristled, and has at basal third a nodosity, covering three enlarged joints, which are furnished with corneous processes. The male fore legs are prominently tufted, but abortion is not carried so far as in the preceding genus, which it follows naturally.

Bleptina and *Tetanolita* should follow the preceding in a natural arrangement.

Hypenula is a curiously dark form which at first sight suggests the tribe Hypenini, but has the wing form of the present series, and, as well, the tufting of the male fore legs, which, however, is not prominent. The male antennæ are laterally bristled, but have no special modification. In a natural sequence this genus should come after *Renia*.

Dereetis is a genus with curious little species in which the male antennæ are pectinated, the branches proportionately very stout, the male fore legs tufted, and the primaries broad, trigonate, the outer margin angulated at middle and excavated below the apex. It should be associated with *Gaberasa* and *Palthis*, from which it differs by the presence of the accessory cell.

Renia is a genus composed of large species in which the apices of the primaries are usually somewhat marked. The lack of accessory cell will distinguish it at once from all the other genera of larger insects in which the wings are not angulated. The male antennæ are peculiar in the presence of a pointed tuft of hair toward the middle, covering a distinct bend or curve, and beyond which the stem is much more slender and inclined to curl. They are laterally bristled, and the structure is unique. The tuftings of the male fore legs are practically obsolete, and the anterior tibial process is much reduced. The genus should follow *Bleptina*, and should be in turn followed by *Hypenula*, though this affords strong leanings toward the *Zancloguatha* type.

Heterogramma has the fore wings angulated, the male antennæ laterally bristled. The fore legs of the male have a large tibial process covering a mass of large scales, but forming no distinct tufts. At the base of the long first tarsal joint is a peculiar ladle-shaped appendage, which has been previously mentioned. The genus follows naturally after *Hypenula*, and is easy of recognition by the characters given.

Gaberasa resembles *Heterogramma* in the female and in all the features of the male, save that the primaries in that sex are cleft for nearly one-third of their distance from the margin, making a distinctive and unique feature in our Deltoid fauna.

Palthis is a remarkable little genus. The fore wings are narrow, pointed, the outer margin angulated and very oblique. The antennæ of the male are laterally bristled and not specially modified. The palpi in that sex are peculiar in the development of a long membranous appendage to the third joint, extending back to the base of the thorax, and to this appendage is attached a tuft or pencil of hair, capable of expansion, similar to the tuftings on the fore legs in other genera.

The fore tibia in the male has the process very large, mop-like at tip, with the dense mass of scales, but without a special hair pencil. The long tarsal joint is furnished with a small pencil, seemingly not capable of expansion, and rather ornamental, and also with a ladle-like appendage toward the tip, similar to that in *Heterogramma*. It would be almost impossible to mistake this genus, with which the present tribe may be closed.

The characters of the Hyphenini as compared with the Herminiini are largely negative, that is they possess none of the specializations in which the latter are so rich. The male fore legs are quite normal, the antennae are at most ciliated and to all appearance not unlike those of the female. The palpi are all after one type, long or moderate, oblique or straight, never closely applied to the front or recurved, second joint always straight, with upright vestiture as in the second group of Herminiini. While there are no sexual modifications of a secondary character in this tribe, the male is quite usually larger, nearly always more somber and even in color, without strong contrasts; the female is often quite brightly and contrastingly marked. Often the male is also much more robust, clothed with loose woolly vestiture on the legs and underside, while the palpi are frequently shorter and more oblique. As a whole the species in this tribe are darker colored and do not have the frail or thinly scaled appearance characteristic of the Herminiini. With the exception of *Capis* all the genera have the abdomen with a series of little dorsal tufts, of which that at base is most prominent. These tufts are round, small, truncated at tip, scaly, and very easily removed by slight rubbing; therefore it is rarely that a quite perfect specimen can be found.

Capis is the aberrant genus of the tribe, and I am not at all convinced that it is really a Deltoid. The palpi only separate the species from the *Caradrina* series, though vein five of the secondaries is usually quite strong; yet this is a somewhat variable feature in the species. Even the palpi are not strictly Deltoid in character; for although they are longer than usual and oblique, yet the vestiture is directed in both directions and the second joint is rather clavate at tip. As in this tribe the palpi tend somewhat in this direction, I did not feel myself justified in excluding the genus. It differs from all the others in the tribe by its complete lack of dorsal tuftings on the abdomen, by the short palpi, and by the short obtuse wings.

Salia is a true Hyphenid genus with moderately long, quite oblique palpi, forming with the prominent frontal tuft a distinct snout. The wings are moderate, widening regularly from the base; the apices are acute, the outer margin very oblique. The markings are quite characteristic, forming oblique pale bands on a pearl-gray ground.

Bomolocha is the genus most numerously represented in our fauna and it includes somewhat divergent forms. The palpi range from moderate to very long, rigidly straight to oblique, and there may or may not be a sexual difference in this particular. The wings are always

broad and trigonate with marked or rectangular apices, never greatly extended, the outer margin moderately oblique, sometimes a little marked centrally. It is not unlikely that this genus may come to be broken up some day, when there is sufficient material from other faunal regions to compare with our own. At present it has seemed to me difficult to draw lines without creating even more names than Mr. Grote has proposed.

Lomanaltes differs from *Bomolocha* only in the greatly extended apices and the very oblique outer margin of the primaries. The palpi do not differ from those of *edictalis*, and no other characters of value have been discovered; the genus resting thus mainly upon wing form and general habitus. From *Salia* it differs by the long palpi.

Plathypena is a very good genus; robust, especially in the male, the palpi rather short, primaries narrow, apices marked, outer margin evenly and obliquely curved, inner margin sinuate, relieving the internal angle which thus forms a sort of tooth or projection. This character is unique and thus separates the genus from *Hypena*, to which the narrow primaries and ample secondaries would otherwise ally it.

Hypena, which is placed at the end of the series as an extreme of the development of its type, has narrow primaries and large broad secondaries. In the primaries the inner margin is even, not sinuate, the hind angle not in the least produced but rather rounded. The apices are marked, while the outer margin is usually more or less markedly angulated at its middle. In this genus also we find the longest palpi of this entire series, projected directly forward, snout-like.

The species so far as they occur in our fauna are largely found east of the Rocky Mountains. Only four genera occur on the Pacific Coast: *Epizeuxis* with a variety of our common *E. lubricalis*; *Heterogramma*, with one species, *H. palligera*, found in the West exclusively; and *Hypena*, all the species of which reach California and Vancouver, while three of the species are confined to that fauna. Very few species extend into Colorado, though one species of *Renia* found there seems peculiar to that State. Quite a number of species range into Texas, which seems, however, to have nothing that is at all peculiar. Arizona seems extremely poor in Deltoids, and there is only one species of *Salia* that is thus far confined to it.

The real home of the group is in that region extending from Maine through Canada, west to the Great Lakes, southward along the Mississippi, and eastward through Ohio, along the southern boundary of Pennsylvania to the Atlantic Coast. In this region most of the species now known to us occur, and some of them are confined to it or even the more northern and eastern portions of it.

All the species fly at night and are readily attracted to light and sugar; but many of them also start freely during the day, flying like Geometers and frequenting similar situations. Some forms are abundant in grass lands and may be found on fences or on bark of trees, and of these are the Hypenini, which readily escape observation by

their dark colors. The Herminiini are more frequent in open wood lands where there is considerable undergrowth, and among the short herbage I have started up *Zanclognatha*, *Chytolita*, *Hormisa*, and *Philometra*. The species are not rare, but they rub very readily and are not favorites with collectors.

Few of the larvæ of our species are known. According to Mr. Henry Edwards' catalogue of described early stages there are eight species only, and of these at least two are somewhat doubtfully known. Yet in this series larval characters may aid in fixing the rank that should be given the Hypenini and Herminiini. So far as my knowledge extends all the former are semiloopers, lacking one pair of abdominal legs, while all of the latter have the abdominal legs complete. The Helini are yet uncertain, but have, probably, sixteen feet.

The insects are not well represented in most collections, either in number or in character. Most of them rub so readily that they are thrown away before spreading if collected with other material in a bottle, and after one or two experiences of this kind the collector does not take them at all. For my studies I used as a basis the collection of the United States National Museum, through the courtesy of the Museum officials. This collection is unusually rich in Deltoids, because for a time I made special efforts to obtain material for study and collected considerable for my personal collection, now in the Museum. At New Brunswick the collection is a very fair one in some directions, and this afforded most of the material for dissections and for the mounts from which drawings were made.

From Dr. J. A. Lintner I have received a large series of specimens in good condition, giving excellent opportunity for the study of variations.

Mr. G. C. Davis kindly sent me all the Deltoids of the Tepper collection, and also those of the Michigan Agricultural College, containing very good material.

Prof. J. H. Comstock sent me a box of specimens taken at Ithaca, which illustrated the character of the local fauna.

From Mr. Neumoegen's collection I had a number of types of species described by Mr. Grote, while all the types from the American Entomological Society have been in my hands for study and comparison.

Several other friends and correspondents have sent me such specimens as I needed and asked for, so I have had before me all save two of the described species, and with those I am autoptically acquainted. As all of Walker's names have now been applied, the present classification of the American Deltoids may be fairly considered as well grounded.

SYNOPSIS OF THE GENERA AND HIGHER GROUPS OF DELTOID MOTHS.

1. Palpi slender, upcurved along the front; anterior femora of the male thickened at base, else the leg normal..... *Helini*, 2.
- Palpi slender, upcurved; or straight or oblique, with upright scaly vestiture, making them blade-like; the fore legs of the male always modified and tufted, tibia always abbreviated and with a long anterior process, *Herminiini*, 3.

1. Palpi straight or oblique, with upright scaly vestiture, this transversely compressed; anterior legs of male entirely normal. *Hyperiini*, 14.
2. Male antennae ciliated, without special modifications; primaries with obtuse apices and rounded outer margin. *EPIZEUXIS* (p. 15)
3. Palpi slender, smoothly scaled, incurved along the front; sickle-shaped. 4.
 Palpi transversely compressed, straight or oblique; never applied to the front; clothed with upright scales, giving it a ragged blade-like appearance. 8
4. Male antennae with two or three joints at basal third furnished with pointed corneous processes covered by scales. 5.
 Male antennae with a pointed tuft of hair at basal third, but no special processes. 6.
 Male antennae ciliated, simply. 7
5. Male antennae laterally bristled. *ZANCLOGNATHA* (p. 27)
 Male antennae bipectinated. *HORMISA* (p. 45).
6. Male antennae bristled; primaries obtuse, trigonate. *TETANOLITA* (p. 61).
7. Primaries narrow, with acute apex and oblique outer margin. *BLEPTINA* (p. 57).
8. Primaries with the accessory cell present. 9.
 Primaries without accessory cell. 12.
9. Primaries angulated, the middle of outer margin produced, excavated below apex. 11.
 Primaries not angulated. 10.
10. Antennae of the male lengthily bipectinated, without special modification at basal third. *PHILOMETRA* (p. 50).
 Antennae of male laterally bristled, with a nodosity covering two or three corneous processes at basal third. *CHYTOLITA* (p. 51).
 Antennae of male ciliated, without special modifications. *HYPENULA* (p. 76).
11. Male antennae coarsely pectinated. *DERCETIS* (p. 82)
12. Primaries not angulated, apex distinct or rectangular; male antennae with a pointed tuft of hair at basal third, covering a bend and finger-like process. *RENIA* (p. 65).
 Primaries with the outer margin produced at middle, angulated; usually a little excavated below apex; male antennae bristled. 13.
13. Primaries broad, entire in both sexes; palpi normal. *HETEROGRAMMA* (p. 78).
 Primaries broad; in the male cleft or split from the middle of the outer margin nearly one-third inward. *GABERASA* (p. 80)
 Primaries narrow, pointed, entire; palpi of male with a membranous appendage furnished with a long pencil of hair. *PALTIUS* (p. 84).
14. Primaries with apices obtuse, outer margin rounded. *CAPIS* (p. 88).
 Primaries broad, trigonate, apices marked, outer margin oblique and rounded, with a variably marked though always slight angulation at middle. *BOMOLOCHA* (p. 91).
 Primaries broad, trigonate, with lengthily produced apices and very obliquely rounded outer margin; palpi very long and straight.
 LOMANALTES (p. 109).
 Primaries narrower, with acute apices and oblique outer margin; palpi short, oblique, forming a pointed snout. *SALLA* (p. 89).
 Primaries narrow, secondaries very broad.
 Inner margin of primaries sinuate, inner angle produced, prominent
 PLATHYPENA (p. 110).
 Inner margin of primaries even, inner angle rounded. *HYPENA* (p. 112).

Genus *EPIZEUXIS*, Hübner.

1816. Hübner, Verzeichniss, 346.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 132.
 1873. Grote, Trans. Am. Entomological Soc., IV, 307.
Helia, Guenée.
 1851. Guenée, Species General, Deltoides, 76.
Pseudaglossa, Grote.
 1871. Grote, Bull. Buff. Soc. Nat. Sci., II, 47.

Eyes naked, large, globose. Front smooth; antennae, situated on the vertex and close to the compound eye; ocelli small, situated behind the antennae and also close to the compound eye. Antennae moderate in length; in the male with lateral bristles and hair tufts, sometimes scaly, not alike in any two species, therefore separately described for each; in the female they are simple with shorter lateral bristles. The palpi are moderate or elongate, closely scaled or with rather rough vestiture, always upcurved, more or less sickle-shaped, always reaching the vertex and sometimes extending far beyond it, their terminal joint moderate or nearly equaling the second in length and acutely terminated. The tongue is moderately well developed. The body is moderate or rather slight, the thorax proportionately small, untufted, the abdomen longer, reaching to or exceeding the anal angle of the secondaries; cylindrical, untufted. The legs are smoothly scaled, proportionate, unarmed save for the usual spurs. In the male the anterior femur is somewhat enlarged at base, inferiorly excavated toward the tip to receive the short tibia, in which the epiphysis is larger than in the female. In the latter sex the anterior leg is normal.

The wings are rather large in proportion to the body, varying somewhat from a strictly trigonate type to a somewhat elongate form, but hardly subequal, though inner and costal margin are nearly of the same length.

The ornamentation is very similar throughout and consists of strongly dentated transverse dark lines, accompanied by white or pale shade lines. As the ground color is light or dark the black or white parts of the lines become more prominent. The secondaries are usually somewhat paler than the ground color and are also marked with more or less obvious transverse lines.

There is a great deal of variation in size and some in appearance among the species of this genus and the female is, as a rule, the larger.

Mr. Grote's reason for accepting *Epizeuxis* rather than *Helia* for this genus seems to be well founded, and my acceptance of the term does not imply that I consider our species distinct from the European forms referred to under Guenée's generic term.

There are two fairly well marked series in the species of this genus which might almost be considered as being of generic value but for the occurrence of intermediate forms.

The first of these series is characterized at a glance by the smooth, glistening vestiture, the scales being closely appressed, and with a

shining, almost greasy appearance. The palpi are long, closely scaled, upcurved, and sickle-shaped, considerably exceeding the vertex, and the terminal joint is nearly as long as the second and acutely terminated. The tarsal claws, so far as examined, are simple. To this series Mr. Grote has applied the term *Pseudaglossa*, and it contains four species.

E. lubricalis is a smoky, blackish brown species, in which the transverse lines are obscurely pale and broken, and the darker accompanying lines only faintly traceable. It varies very decidedly in size and to some extent in wing form; but it has a characteristic appearance difficult to mistake. Sometimes paler specimens occur, and in these the dark transverse lines are evident, the pale lines being more or less completely merged into the ground.

E. denticulalis is closely allied, with almost exactly the same markings; but it is of a dull, pale luteous ground color, powdered with brown scales, and the transverse lines are blackish. From pale forms of the preceding it is distinguished by having the space between the median and transverse posterior line dark filled toward the inner margin, which gives the wing a quite characteristic appearance.

E. rotundalis is a much smaller species than either of the preceding, and is, indeed, the smallest in the genus. The primaries are usually an almost uniform smoky brown, the markings being barely perceptible in local varieties only and the secondaries are almost as free from maculation, though much paler. The species is not easily mistaken.

E. scobialis is not much larger than the last preceding; but the ground color is almost black, and lacks almost completely the glistening appearance, while the transverse lines are quite distinctly white, narrow, and broken, in sharp contrast to the others.

Intermediate between the above series and that next following is *E. laurentii*, described by me. In appearance it belongs at first sight with the following, having a powdery vestiture without gloss; but the palpi are quite decidedly like those of *E. scobialis*, and it resembles that species in the dark color of the primaries and the narrow distinct median lines. The secondaries are pale, however, and distinctly marked by transverse lines. *E. scobialis* and *E. laurentii* further agree in having the abdomen black with narrow white rings margining the segments. The tarsal claws are toothed, resembling the following series.

The second series to which reference has been made differs in the rougher vestiture without any trace of sheen or glisten, and on the contrary a tendency to the powdery appearance marked in *E. laurentii*. The palpi are more robust and are not nearly so long, reaching to the vertex or slightly exceeding it, except in *E. majoralis*, in which we have a tendency to the preceding series, though the terminal joint is not so acutely terminated. In this series the tarsal claws are toothed, and three species are referable to it.

E. majoralis is a species which has been confused with both *E. amula* and *E. americanis* and is in some respects intermediate between them, possessing characters however that ally it very strongly to series 1. It is the largest of the species of the second series, and in wing form is very like specimens of *E. lubricalis* of the same size and less trigonate than in either of the others. The palpi considerably exceed the vertex and are longer than in either of its nearer associates, though as much shorter than in *E. lubricalis*. In color and maculation it is dusky and powdery like *E. amula*; but it has a distinct prominent preceding shade to the costal region of the subterminal line, and in this it resembles *E. americanis*.

E. americanis is whitish ashen gray in color, with the transverse lines distinctly marked, the median shade being especially prominent, and the subterminal line preceded by a distinct black shade.

E. amula is a more even, dull gray, very much powdered and without any sharp contrast in maculation; though all the lines are usually distinct and very like the preceding.

ANALYSIS OF THE SPECIES OF EPIZEUXIS.

Palpi much exceeding the vertex, terminal joint acute, closely scaled, nearly as long as the second.

Vestiture smooth, glistening.

The ground color is smoky black, median lines pale; median space even,

LUBRICALIS.

The ground color is dully sordid luteous, the median lines blackish; a dusky, subquadrate patch in the outer lower angle of the median space,

DENTICULALIS.

Ground color smoky black, all the lines obsolete or but vaguely traceable; a very small species

ROTUNDALIS.

Ground color black, secondaries scarcely paler; lines narrow, broken, contrasting, white

SCOBIALIS.

Vestiture rough, not glistening, powdery.

Blackish gray, the maculation distinct, lines narrow, black and white, strongly dentate

LAURENTII.

Palpi reaching to or somewhat exceeding vertex; terminal joint usually considerably shorter than the second, more roughly clothed, not so acutely terminated.

Maculation contrasting; blackish, sharply marked on a light gray ground, size moderate

AMERICANIS.

Maculation not contrasting except for a black costal blotch preceding the subterminal line; ground color powdery dull gray, suffused with yellowish; size large

MAJORALIS.

Maculation obscure, not contrasting; ground color dull gray, powdery over luteous; size moderate

EMULA.

Epizeuxis lubricalis, Geyer.

1832. Geyer, Zuträge, IV, 19 figs. 665, 666, *Epizeuxis*.

1851. Guenée, Species General, Deltoides, 77, *Helio*.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 135, *Epizeuxis*.

1874. Grote, Bull. Bufl. Soc. Nat. Sci., II, 17, *Pseudaglossa*.

1881. Grote, Canadian Entomologist, XIII, 91, *Epizeuxis*.

1880. Coquillett, Canadian Entomologist, XII, 44, larva.
phœalis, Guenée.
 1854. Guenée, Species General, Deltoïdes, 76, *Helia*.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 133, *Epizeuxis*.
 1873. Grote, Trans. Am. Entomological Soc., IV, 308, *Helia*.
 1874. Grote, Bull. Buff. Soc. Nat. Sci., II, 47, pr. syn.
 1883. Grote, Canadian Entomologist, XIII, 91, pr. syn.
surrectalis, Walker.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 241, *Bleptina*.
 1877. Grote, Canadian Entomologist, IX, 29, pr. syn.
 var. *occidentalis*, Smith.
 1884. Smith, Bull. Bkln. Entomological Soc., VII, 5, pr. var.

Ground color of body and fore wings a dark, sooty, glistening, blackish brown; abdomen and secondaries paler with a yellowish tinge. Head and thorax immaculate. Primaries with the transverse lines variably distinct, but always traceable, consisting of a dark and a pale line, of which the pale line only is usually distinct. Basal line frequently wanting and always inconspicuous. Transverse anterior line outwardly oblique, doubly toothed in the costal region, and outwardly curved in the interspaces below; the dusky line is the outer. Transverse posterior line with the dark line inwardly, in general course slightly outcurved, quite strongly denticulate, the outward teeth on the veins. The subterminal line is pale, irregularly sinuate and dentate. There is a lunate black terminal line and a yellowish shade line at the base of the fringes. The median shade line is obscurely marked in a few specimens; but as a rule is obsolete. The orbicular is reduced to a yellowish dot and is quite frequently entirely wanting. The reniform is usually marked only as a yellowish lunule, sometimes accompanied by a blackish mark through its center or outer margin. The secondaries have a yellowish tinge, most marked basally and they darken outwardly, marked by alternate dusky and paler bands and lines, sometimes almost obsolete, sometimes quite well marked, but never distinctly dentate. Beneath, the wings are smoky, varying to dull powdery luteous with a median and extra-median dusky, followed by pale lines. Both wings with a discal lunule always rather prominent on the secondaries, frequently quite reduced and sometimes obsolete on the primaries.

Expanse of wings, 25 to 40 mm.=1 to 1.60 inches.

HABITAT.—United States generally; northward to Nova Scotia, and found from midsummer to autumn. In Texas, dates are May and October, and a second brood is indicated.

The variation in this species is primarily in size and in the ground color, which in pale specimens results in giving prominence to the dark hues, while in the dark specimens the pale lines become most evident. A large, pale form, in which the lines become diffuse, is found on the Pacific Coast, and this is my variety *occidentalis*, which I have not seen from the East.

The antennæ in both sexes are furnished with lateral bristles, and in both there is a dense clothing of scales, which gives the member a decidedly thickened appearance. In the male the joints are short and the bristles are set in very close to the base—so close, indeed, that they appear to arise from the suture. Above the point at which these lateral bristles are inserted are small, teat-like processes, which are furnished with a tuft of bristly hair, and other similar, though shorter, hairs are on the upper surface of each joint, arising from small, tubercle-like processes. Among these processes are small pittings without hair, which are probably sensory in character. In the female the antennal joints are longer, more cylindrical, and the lateral bristles are less prominent, set into distinct pits on the sides, though rather close to the base, and they lack the bristly tubercles entirely. The harpes of the male are quite simple, the upper angle produced into a pointed process, while inferiorly and toward the base is a somewhat chitinous process with a knob-like tip, which is furnished with short, stiff spines and hair.

Epizeuxis denticulalis, Harvey

1875. Harvey, Bull. Buff. Soc. Nat. Sci., II, 283. *Pseudaglossa*.

Ground color a pale, somewhat yellowish, gray, with black powderings; abdomen and secondaries paler, the former with the edges of the segments pale ringed, the latter more thinly scaled. Primaries with all the lines distinct. Basal line very close to the root of the wing, and not prominent; dusky. Transverse anterior line nearly upright, dark sepia brown, preceded by an undefined line only a little paler than the ground color, indented on the veins and irregularly outcurved in the interspaces. Transverse posterior line irregular, strongly denticulated, as a whole nearly parallel with the outer margin, dark brown, followed by an indefinite, slightly paler shade. An obvious median shade line, smoky brown in color, crosses the median space over the reniform, and below that spot darkens its outer portion to the inner margin. Subterminal line pale, strongly and irregularly dentate, variably distinct, preceded by a variably distinct dusky shade, which is most marked on the costa. A series of dusky terminal lunules, beyond which the pale fringes are cut with brown. The orbicular is wanting, or traceable only as a paler dot. Reniform a paler, yellowish lunule, outwardly defined by a dark crescent. The secondaries are crossed by three variably distinct dusky bands, the two outer of which are more or less dentate. The bands are not sharply marked except at their outer margin, thinning out toward base in each case. A distinct blackish terminal line. Beneath, the primaries are dusky, and there is a more or less evident reproduction of the transverse posterior and subterminal lines of the upper side. The secondaries are more luteous, and have two distinct, brown, even extra median, lines and a blackish marginal line. Both wings have a discal lunule, that of the primaries less distinct and sometimes obsolete.

Expanse of wings, 25 to 30mm=1 to 1.20 inches.

HABITAT.—New York to Texas; District of Columbia in July and August.

This species is by no means so common as the preceding, and is not generally distinguished from it. It is sometimes ranged as a pale form of *E. lubricalis*, or more frequently a pale form of that species is labeled *E. denticulalis*. The present species is always recognizable by the obvious median shade line and the dusky patch in the outer inferior angle of the median space. The rather prominent pale rings to the margin of the abdominal segments are also somewhat distinctive. From the specimens I have seen the species varies much less in size and in ground color than *E. lubricalis*, and is a very well-defined one.

Unfortunately, I failed to find among the material before me any female specimens, hence can not speak of the antennal characters of that sex. The male antennae resemble quite strongly those of *E. lubricalis*; but all the features are more intensified: the joints are broader, the scales more dense, the lateral bristles are longer and more stout, the tuberculate processes bearing hair, are more prominent and the hairy tufts are more conspicuous, and, finally, the tubercles giving rise to separate hairs are much more numerous. Examined with a hand lens, the impression is that the member is much more bushy than in the preceding species. In the primary sexual characters there is little differing from the preceding. The type of the harpe is exactly the same, and only the proportion of the parts differ slightly. In wing form this species is quite considerably different from *E. lubricalis*, the primaries being distinctly more trigonate, proportionately shorter and broader, making the outline quite markedly different.

***Epizeuxis rotundalis*, Walker.**

1865. Walker, Cat. Brit. Mus., Heterocera, XXXIV, 1111, *Hormisa borealis*, Smith.

1881. Smith, Bull. Bkln. Entomological Soc., VII, 5, *Helia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 378, pr. syn.

forbesii, French.

1891. French, Bull. Ill. State Lab. Nat. Hist., IV, 9, *Pseudaglossa*.

Head, thorax, and primaries blackish, smoky, glistening; secondaries and abdomen paler, more thinly scaled. Primaries almost immaculate, only the most vague traces of the ordinary lines being observable in most specimens. Sometimes, however, all of them are traceable or at least feebly indicated by pale scales, though more often they are not traceable in any way, and we have a uniform smoky-brown surface delightfully easy to describe. The secondaries are also as a rule nearly immaculate, though some traces of the usual median and extra-median dusky brands may be discovered, and in some cases these are fairly well marked. Beneath, the wings vary from quite pale whitish gray to smoky, and the usual transverse lines are sometimes well marked, especially on the secondaries. The maculation is most evident when the ground is lightest and then also a discal spot is usually present.

Expanse of wings, 17 to 20 mm. — 0.68 to 0.80 inch.

HABITAT.—Canada to Virginia, westward to the foothills; June and July.

This is the smallest of the species in average expanse, and is still shorter and rounder winged than *E. denticulalis*. It is quite easily recognizable by its almost immaculate wings and is by no means uncommon locally. It seems more frequent in northern localities, but I have received it from Virginia, and westward it occurs in Iowa and Nebraska. I have not had it from Colorado or any point in the Sonoran faunal region.

The antennæ are well developed in both sexes. In the male the joints are well marked and short, the lateral bristles are long and stout and are set in deep pits. Near to the insertion of these lateral bristles is a rather large process set with hair about the tip, and near the tip is another similar process also clothed in the same way, while other smaller tubercles and pits give rise to single hairs. This gives the joints a much greater number of bristles and therefore a more brushy or brush-like appearance under a hand lens than any of the other species thus far described. The antennæ of the female are furnished only with weak lateral bristles, much shorter than those of the male, and the joints are without hairy processes. The male sexual characters are of the same type as in *E. lubricalis*, but differ in that the superior margin of the harpe is not drawn out and chitinized, while the process from the inferior margin is much longer and more prominent.

The *Pseudaglossa forbesii*, French, is based upon specimens in which the maculation is quite well defined, and all of it traceable, resembling thus, somewhat, a small *E. lubricalis*, except in wing form. To the kindness of Prof. S. A. Forbes I owe an opportunity to examine one of the types, which enables me to make the reference definitely. A comparison of the figures given on Plate I will at once show the relationship of the forms.

***Epizeuxis scobialis*, Grote.**

1880. Grote, North American Entomologist, I, 95, *Pseudaglossa*.

Ground color smoky black without luster; secondaries scarcely paler; abdomen narrowly white banded at the edges of the segments. Primaries with all the lines present, narrow, white, and broken, accompanied, however, by black lines which are traceable on close examination. Basal line reduced to a slender white line. Transverse anterior line distinct, though usually broken and sometimes reduced to a series of white scales; upright as a whole, but somewhat irregularly out-curved in the interspaces. Transverse posterior line distinctly marked on the costa by a triangular white patch, but beyond that reduced to a broken track of white scales in most instances; but it is sometimes distinct though narrow; in course it is as in the preceding species

and is irregularly dentate. Subterminal line always distinct, narrow, white, irregularly sinuate and dentate, best marked in the costal region. A series of somewhat obscure terminal spots, interrupted by more prominent white dots. The orbicular is distinct as a white dot in all the specimens I have seen and the reniform as a narrow upright white streak which is scarcely a lunule or crescent. Secondaries with median and extra-median narrow denticulated white lines, which are variably distinct; in some specimens a black discal spot is visible. Beneath, black and white powdered, primaries repeating the subterminal and transverse posterior lines, while the secondaries reproduce the maculation of the upper side. Both wings have a black discal spot.

Expanse of wings, 22 to 25 mm. = 0.88 to 1 inch.

HABITAT.—Eastern, Middle, and Central States. New York in June and July.

This is one of the smaller species, and most nearly resembles *E. lubricalis* in wing form; seeming, indeed, only a somewhat further step in the depth of the ground color, and replacing by white the sordid yellowish of the pale lines. This contrast, the narrow, usually broken white lines on almost dull-black ground, as well as the white-ringed abdomen, makes this species easy of recognition. The sexual pieces, so far as they have been examined, resemble *E. lubricalis* quite closely; but I have not had a male free for dissection. The species is not common and is most usually taken at night in my experience.

The antennæ differ quite obviously from those of *E. lubricalis* in both sexes. In the male the joints are less marked, the lateral bristles are feeble, not as well developed, indeed, as in the female of its ally, and there are no piliferous processes or tubercles. A comparatively few hairs rise from small punctures, but they are scant in number and feeble. In the female the lateral bristles are yet further reduced and are hardly more than stout hairs, and we have, thus, an actual and marked structural character supplementing those drawn from maculation.

Epizeuxis laurentii, Smith.

1893. Smith, Entomological News, IV, 83, *Epizeuxis*.

Ground color of head, thorax, and primaries powdery blackish over dirty whitish, the latter color visible in the markings. The usual transverse lines are rather prominently defined by the whitish color, but the accompanying black lines are in all cases traceable. Basal line distinctly marked. Transverse anterior line upright, its course irregular, the most prominent modification consisting of a squared outward bend in the submedian interspace. Transverse posterior line strongly denticulated, its course on the whole a somewhat even and not very marked outcurve. Subterminal line pale, prominent, irregularly sinuate and dentate, a broken, black terminal line, beyond which is a very narrow pale line at the base of the fringes, which are blackish and pale tipped, cut with narrow pale streaks opposite the veins. There is an

obvious, somewhat diffuse and nearly upright, black median shade line. The orbicular is pale, punctiform. The reniform is pale, somewhat indefinite and variable in size, with a more or less complete central lunule, sometimes reduced to a mere point in the inferior portion of the spot. Secondaries gray, with a blackish overlay, forming a dark subbasal band and distinct median and extra median dentate pale lines. There is an interrupted black terminal line and the fringes have a central dark shading. Abdomen blackish, the edges of the segments annulate with whitish. Beneath powdery, the primaries blackish outwardly, with the transverse posterior and subterminal lines of the upper side somewhat indefinitely reproduced; secondaries gray, the markings of the upper side less distinctly duplicated, and with a very distinct black discal lunule.

Expanse of wings, 23 to 26 mm.=0.92 to 1.04 inches.

HABITAT.—Mitchell County, N. C.; in July.

This species is most nearly allied to *E. scobialis*, agreeing with it in the dark color and the banded abdomen. It differs in the wider wings, powdery clothing of both wings, and the pale secondaries, agreeing in these characters with the following species. On the other hand, the palpi are entirely like those of *E. scobialis*, and this species it also resembles most nearly in antennal structure. In both sexes the antennae are quite heavily scaled, the scales somewhat uplifted. In the male each joint is furnished with a single pair of lateral bristles, which are reduced to bristle-like hair in the female, so the joints may be almost said to be simple.

This is a curiously intermediate form, perhaps more nearly related to the *Pseudaglossa* series, but in clothing and ornamentation more allied to *Epizeuxis*.

Epizeuxis americalis, Guenée.

1854. Guenée, Species General, Deltoides, 78, pl. 6, fig. 5, *Helia*.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 134, *Epizeuxis*.

1873. Grote, Trans. Am. Entomological Soc., IV, 307, *Epizeuxis*.

1883. Riley, Canadian Entomologist, XV, 171, larva.

scriptipennis, Walker.

1858. Walker, Cat. Brit. Mus., Heterocera, XV, 1765, *Microphysa*.

1868. Grote and Robinson, Trans. Am. Entomological Soc., II, 79, pr. syn.

1873. Grote, Trans. Am. Entomological Soc., IV, 307, pr. syn.

Ground color of head, thorax, and primaries pale, bluish ash gray, more or less black powdered. Head and thorax not maculate. Primaries with the outer part of median space yellowish brown, varying in distinctness, and beyond this the wing is more or less suffused with sordid yellowish brown, which, as a rule, does not extend to the costa. All the transverse lines distinct. Basal line marked on the costa only by a blackish spot. Transverse anterior line upright, irregularly out-curved between the veins, black, preceded by a white line, which is variably distinct and marked outwardly on the costa by a distinct trigonate black patch. Transverse posterior line black, followed by a

white line, and preceded on the costa by a distinct black or brown blotch, which usually extends to the inception of the median line. In its course it is acutely dentated on the veins, outwardly oblique from costa to vein 4, thence incurved to the inner margin. Subterminal line prominent, white, preceded by a distinct black shade much broader toward the costa and irregularly sinuate and dentate. The median line is distinct, somewhat diffuse, nearly upright, a little irregular in the upper half of its course. A black terminal line, which broadens out superiorly, forming a somewhat prominent black shading. Fringes sordid yellowish, cut with smoky brown. The orbicular is obsolete or small, marked by a diffuse yellowish spot, which is never defined. Reniform not defined, always evident, rather large, consisting of a yellow annule, inwardly marked by the median line and outwardly merged into a rusty brownish shade, which extends to the transverse posterior line. Secondaries smoky brown, sometimes paler, often with a yellowish suffusion, crossed by three blackish lines. The first of these is within the middle, and is even, not shaded. The second is median, somewhat bent at the middle of its course, and followed by a yellow shading. The third is submarginal, quite strongly bent about one-third from the costa, and also followed by a yellow shade. A distinct, continuous, black terminal line, beyond which the dusky fringes are cut with yellow. The abdomen is gray, the edges of the segments yellowish white, giving a somewhat obscurely banded appearance. Beneath, the wings are dull luteous, with black and white powderings, crossed by three dusky lines, of which the second and third are followed by a pale shade. A black terminal line. Secondaries with a linear, black discal mark.

Expanse of wings, 20 to 27 mm.=0.80 to 1.10 inches.

HABITAT.—Canada, southward to Florida to Texas; westward to the Rocky Mountains; New Mexico. In its northern range it occurs from July to September; in Texas to November.

A very common and not very variable species, always distinguished by the pale whitish or bluish gray color and the contrasting transverse lines, which are emphasized on the costa by distinct black or blackish blotches or marks. The dilation of the upper part of the terminal line into a broad shade is also peculiar to the species, and is a very excellent distinctive character. The antennæ in the male are furnished with long, stout lateral bristles, longest at basal third and very gradually diminishing toward the tip, set in near the base of each side of each joint. Below this lateral bristle is a short process, inconspicuous toward base, becoming a short pectination near the middle, and again decreasing toward the tip; becoming first a mere tubercle and then disappearing altogether. This process is furnished with a large sensory bristle at the tip, and is set with smaller hairs at the sides and base. On the outer side of each joint is another conical elevation or tubercle, a little beyond the middle of each joint, and this also gives rise to tufts of sensory hairs. This tubercle disappears gradually toward the tip

as the joints elongate. The underside of all the joints are pitted, most prominently so toward the middle. In the female the joints are furnished with short lateral bristles, arising very close to the base, and there are no lateral tubercles. The sensory pittings, however, are even more prominent than in the male, and the surface on the upper side is imbricated in appearance. The harpes of the male are quite simple, nearly squarely cut off at tip, and there is a broad corneous process near base which is obtusely produced superiorly. Altogether the species is a well-marked one.

Epizeuxis majoralis, new species.

General ground color dull smoky fuscous, with luteous and black powderings. Head and collar sometimes marked with fuscous. Primaries with the costal region whitish gray, with the inception of the ordinary lines marked by dusky patches, less distinct than in *E. americanis*. Ordinary lines all defined, though hardly distinct except on costa. Basal line obscure, marked by white scales. Transverse anterior line nearly upright, unevenly outcurved in the interspaces, blackish, outwardly marked by a costal dusky spot, inwardly by a paler shade, becoming white on the costa. Transverse posterior line irregularly and strongly dentate as a whole, with a tolerably even outcurve; incurved in the submedian interspace, somewhat dilated on the costa and followed by a pale shade, which is white on the costa, else yellowish, except near the inner margin, where white powderings sometimes obtain. Subterminal line irregularly dentate and angulate, white in the costal region, where it is preceded by a distinct, broad black shade, becoming yellowish and sometimes almost lost toward the inner margin. A narrow, even, or only slightly lunate, terminal black line. Fringes smoky, cut with luteous over the interspaces. The median shade is nearly upright, vague, diffuse, sometimes hardly traceable. The ordinary spots are marked as indefinite luteous blotches, and sometimes a luteous shade is apparent through the median cell. Secondaries paler, more powdery than the primaries, with three transverse lines, of which the outer is most evident, whitish, and sharply dentate. An even, dusky terminal line. Beneath whitish, powdery, with three confused indefinite transverse lines and a discal spot on all wings.

Expanse of wings, 29 to 34 mm. — 1.20 to 1.37 inches.

HABITAT.—New York (Ithaca); Ohio (Columbus); Illinois (Carbondale).

I have six specimens of this species before me, all of them females. The species is curiously intermediate in maculation between *E. amula* and *E. americanis*, but is larger than either, and differs from both in the long palpi, which considerably exceed the vertex, while they are shorter than in the *Pseudaglossa* series. In the shape of the primaries it more nearly resembles *E. amula* in the rounded apex and outer margin than *E. americanis*, in which the apex is rectangular and somewhat well defined.

It is more than probable that specimens of this species are in other collections mixed with either *E. amula* or *E. americanalis*, but the species seems more rare than either. It is represented in the National Museum collections by two poor specimens, without locality, marked July, and which were found with *amula*.

Epizeuxis æmula. Hübner.

- 1815. Hübner, Exotische Schmetterlinge, III, 1. G. a., *Idiadolosa*.
- 1816. Hübner, Verzeichniss, 346, *Epizeuxis*.
- 1851. Guenée, Species General, Deltoides, 78, *Helia amulalis*.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 134, *Epizeuxis*.
- 1873. Grote, Trans. Am. Entomological Soc., IV, 307, *Epizeuxis*,
mollifera, Walker.
- 1858. Walker, Cat. Brit. Mus., Heterocera, XV, 1765, *Microphysa*.
- 1868. Grote and Robinson Trans. Am. Entomological Soc., II, 79, *Epizeuxis*.
- 1874. Grote, Bull. Buff. Soc. Nat. Sci., II, 47, pr. syn.
herminioides, Walker.
- 1860. Walker, Can. Nat. and Geol., V, 259, *Homoptera*.
- 1865. Bethune, Canadian Journal, X, 258, *Homoptera*.
- 1877. Grote, Canadian Entomologist, IX, 28, *Epizeuxis*.
- 1893. Smith, Bull. 44, U. S. Nat. Mus., 379, pr. syn.
effusalis, Walker.
- 1860. Walker, Can. Nat. and Geol., V, 264, *Hormisa*.
- 1877. Grote, Canadian Entomologist, IX, 29, pr. syn.
concisa, Walker.
- 1860. Walker, Can. Nat. and Geol., V, 265, *Hormisa*.
- 1877. Grote, Canadian Entomologist, IX, 29, pr. syn.

Ground color, a dull smoky gray over luteous; powdery. Head and thorax uniform; immaculate. Primaries uniformly colored, without contrasting shades; the transverse maculation distinct, but not contrasting or prominent, and not marked by costal spots or blotches. Basal line reduced to a black mark on the median vein and sometimes a small costal spot. Transverse anterior line nearly upright, with three variably marked outcurves in the interspaces; single, black. Transverse posterior line black, denticulate, as a whole outcurved, somewhat retracted in the submedian interspace, followed by a yellowish shade which, as a rule, is marked on the costa, but is rarely conspicuous elsewhere in its course. Subterminal line pale, sinuate and irregularly angulate or dentate, usually defined on both sides by a darker shade; but this may be confined to a preceding shade, and may be entirely absent. Terminal line black, broken into humules, followed by a pale or yellow line at the base of the usually immaculate fringes. The median shade is blackish, nearly upright, very variably marked and sometimes quite prominent. Orbicular reduced to a small yellow dot as a rule. Reniform yellow, large, somewhat defined, interiorly marked by the median shade, and often with two small black dots marking the upper and lower margins, forming the only prominent feature in the wing maculation. Secondaries much paler, more grayish, and appearing more thinly scaled; powdery, crossed by three transverse lines, of

which the outer is pale and slightly dentate. A broken, black terminal line, followed by a yellow line at the base of the fringes. Beneath, powdery, the wings crossed by three very variably distinct transverse lines, of which the outer is more or less denticulate.

Expanse of wings, 19 to 28 mm. — 0.75 to 1.12 inches.

HABITAT.—East of the Rocky Mountains: northern and eastern range, July to September; south and southwest, March to November: Colorado in September.

This is a common species, with quite a range of variation in size, and a considerable variation in the distinctness of maculation. The greatest contrast is shown in the reniform spot, which, while normally yellow, is sometimes invaded by the median shade, and becomes occasionally black and quite strongly marked, differing prominently from the more usual form. Sometimes forms occur in which all contrast is lost and they are then almost uniformly gray and powdery. The antennae of the male have the usual long lateral bristles, and below these a well-marked pectination or process of moderate length, considerably exceeding those of *E. americanis*, but, like them, clothed with tufts of sensory hair. There are no supplementary lateral tubercles as in the allied species, and the pits on the underside of the joints are less numerous. In the female the antennae have the usual slender lateral bristle and the underside of the joints are marked with sensory pittings. The scaly markings so distinct in *E. americanis* are here barely traceable. The sexual characters of the male are well marked. The harpes are narrowed at the middle and drawn out, and the tip is rather irregularly rounded. The claspers arise from a stout base and are attached to the harpes to the middle, whence they are separate as stout, slightly curved, cylindrical, and pointed prongs. The species thus differs throughout from *E. americanis*, of which I was at one time inclined to consider it a variety, deeming the form now separated as *E. majoralis* to be an intermediate type, which indeed it is, so far as maculation alone is concerned.

Genus **ZANCLOGNATHA**, Lederer.

1857. Lederer, Noctuiden, Europas, 211.

Pityolita, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39.

Cleptomita, Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 301.

Megachyta, Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 306.

Eyes naked, large, globose. Front smooth, in perfect examples with a pointed tuft between the antennae: but this is a variable and often defective feature. Tongue long and stout. Antennae moderate in length, arising from the vertex, close to the compound eye, the basal joint enlarged, much stouter than the remainder of the stalk; but the dilation much less marked in the female. In the male the antennae are furnished with lateral bristles on each joint, and at about one-third

from base there is a thickening of the stem, principally caused by a dense clothing of scales outwardly, marking a more or less evident bend, and beyond this are two or three joints, each of which has also a stout, claw-like process on the inner side. Two is the usual number, and three the exception. In the female the antennae are simple or scaled, or with small lateral bristles, and as no two species are quite alike in this particular this feature will be separately described for each. The palpi are very long, curving upward, far exceeding the vertex, the second joint much the longest, the vestiture quite closely appressed or even smoothly scaled, never with upright or blade-like upper edge: quite markedly sickle-shaped. Ocelli distinct, close to the compound eye, and quite well removed from the base of the antennae. The body is slight compared to the wings, the thorax proportionately small, untufted, the abdomen cylindrical, subequal, untufted, reaching to or exceeding the anal angle of secondaries. Legs long, slender, closely scaled, the posterior much the longest and in these the tibiae are stouter than elsewhere. There is no armature save the usual spurs of the middle and hind tibiae, and these are very long and somewhat unequal, the inner spurs considerably the best developed.

In the males the fore legs are considerably modified and curiously tufted, coxa, femur and tibia becoming greatly changed to accommodate these abnormal appendages. As they vary in the species and have been already generally characterized they will be separately described under the specific headings.

The wings are large, the primaries trigonate, with rectangular or obtuse apices and very evenly and not greatly curved outer margins, the inner margin not much shorter than the costa. The venation is normal: but varies somewhat in the arrangement of the veins arising from the accessory cell; 10 being sometimes from the middle of the upper margin, sometimes from the end, and sometimes even from a stalk with 8, a short distance beyond it.

Under the above definition are included the species of *Pityolita*, *Cleptomita*, and *Megachyta*, as well as those usually referred to *Zanclonatha*, because I have found it impossible to find valid characters for their separation. Mr. Grote never attempted to distinguish the genera except in the most indefinite way, scarcely doing more than to designate the type, and the difference in superficial appearance has kept them apart since.

In the species referred to *Megachyta*, the median lines are thickened at their inception on the costa, forming more or less prominent spots, and this gives the species a characteristic appearance, which almost entirely vanishes in *Z. inconspicualis*. There is also a seeming difference in wing form, which proves elusive on careful examination, and leaves me without a reasonable basis for the genus.

Cleptomita has nothing at all to support it save its distinctive maculation, and even this is close in type to that of *Z. lorigata*. The type

and only specimen ever seen by me is imperfectly set and is misleading in the impression it gives of the wing form and general habitus. This does not seem to differ in the least from *Zanclognatha*, while no structural character is apparent to me on close examination.

Pityolita has slightly more determinate apices of the primaries, enhanced by a somewhat narrower base, making them a little more evenly trigonate than in the normal type; but, unfortunately, this difference is inconstant and becomes greatly lessened in some large females, making it thus an unsafe basis of division. The species fits very neatly among the typical species of the genus.

The species formerly referred to *Megachyta* form a fairly well-marked division of the genus, recognizable by the costal enlargement of the ordinary spots which, even when least marked, is in quite strong contrast to the even threadlike lines of all the other species save *Z. minimalis*, which somewhat resembles *Z. inconspicualis* in this particular, but is much larger and, in other respects, quite well separated.

Z. lituralis is at once separable from all other species by a series of three distinct brown costal spots, of which the outer is apical and follows the subterminal line. It is also the largest of this series and in all respects the best marked as well as the most common.

Z. theralis, Walker, or *Z. decepticalis*, Grote, is a decidedly smaller gray species, in which the costal spots on the median lines are black and quite well marked; but the third spot is much less defined, is not apical, and precedes the subterminal line, continuing for a greater or less distance to emphasize this line, and often no more marked on the costa than on the hind margin. In this species the transverse posterior line makes a very abrupt outward bend below the costal spot, and the line runs in close proximity to the subterminal line for the balance of its course.

Z. minoralis is also gray, but yet smaller than the preceding, from which it also differs by the broad, somewhat diffuse median lines, which are scarcely enlarged on the costa, the transverse posterior regularly outcurved, and by the absence of any dark shade to the subterminal line.

Z. inconspicualis is scarcely larger than the preceding, with much the same markings; but it is dull, smoky-brown in color, and the median lines are narrow, scarcely enlarged on the costa.

It is possible that there may be a closer relation between the last-mentioned two species than seems probable at present. I have only two males of *Z. minoralis*, and but three females of *Z. inconspicualis*, the latter not showing any appreciable variation; but the markings are apparently identical, and the strong difference in ground color with the relative distinctness of the median lines may possibly come within the range of variation in this series.

Of all the other species referable to this genus, none except *Z. minimalis* shows any trace of any costal enlargement of the median lines,

and here the dilation is exceedingly slight and not liable to cause confusion.

Z. larvigata and *Z. punctiformis* are peculiar in this series by the character of the subterminal line, which is sinuate, and this character will serve to distinguish the former through all its protean changes of color. Only one other of the Deltoid series approaches this in variability—*Renia discoloralis*—and that is, of course, impossible to confuse with either of the above. In ground color *Z. larvigata* may vary from carneous gray to almost black, and the color may be even or powdery; the primaries may have the median space contrastingly red, or brown, or yellowish, or gray; or this space may be dark, while all else is contrastingly paler. A good series of this species is in itself a lesson in insect variation, and yet with all this change in color there is practically no variation in the markings, i. e., the course of the ordinary lines. It is probable that under the term *Z. obsoleta* I have redescribed an almost immaculate form of this species.

Z. punctiformis, which at first sight resembles *Z. larvigata* quite strongly, has the transverse anterior line outcurved, while in its ally it is rigid, and the subterminal line is pale and somewhat lunulate, each lunule preceded by a black spot, which is inwardly diffuse.

Z. atrilineella is also distinctive in appearance, and is allied to *Z. larvigata*, though much smaller, and probably abundantly distinct. It is characterized by the prominent black median lines, the inner quite diffuse, and by the black shade preceding the subterminal line. Unfortunately a single imperfect specimen only is known, and there is no information as to whether we have a normal form, or one that is an extreme variation. I deem it not unlikely that *Z. larvigata* may sometimes take on a similar appearance; but do not mean to suggest any specific relation between the two.

In all the following species the subterminal line is even and straight; usually it is pale, and in many instances preceded by a dusky shade.

Z. pedipalis is a luteous gray form and differs from all its neighbors in that the subterminal line is dasky and only occasionally followed by a vague paler line. It is also abbreviated below the apex and does not reach the costa, terminating in such a way as to make it appear that its continuation would reach the extreme tip of the wing, where a dusky dot intensifies this impression. The transverse posterior line is usually quite distinctly angulated over the cell, and the transverse anterior line is even, not denticulated. The peculiar course of the subterminal line adds to the impression that the forewing is more pointed than is really the case.

Z. cruralis is allied to *Z. pedipalis*, but is brown, and the subterminal line is pale, preceded by a distinct dark shade, reaching the costa without break. The transverse anterior line is even, and the transverse posterior line less angulated over the cell; but it has a more distinct incurve in the submedian interspace.

Z. obscuripennis is very close to *Z. cruralis*, but it is darker and more obscurely marked. The transverse posterior line is similar in general course, but is much less evident and is irregular, somewhat denticulate, not even. These characters are readily noted and the nature of the transverse posterior line is usually decisive of the species.

Z. protumnosalis, better known as *Z. minimalis*, is another dark species much like *Z. obscuripennis* at first sight; but it differs in the irregular transverse anterior line, and the yet more denticulated transverse posterior line. In the character of the transverse anterior line this species differs from both *Z. cruralis* and *Z. obscuripennis*, but agrees with *Z. marcidilinea* and *Z. ochreipennis*, from which it differs by its smoky or blackish color.

Z. marcidilinea and *Z. ochreipennis* are yellowish or luteous forms and are very closely allied. Superficially, *Z. marcidilinea* is smoother, more evenly colored, and the median lines are less irregular; while in *Z. ochreipennis* the vestiture appears rough and powdery, there is a distinct tendency to a darkening of the outer part of the wing, and the median lines are more denticulated, sometimes, in the transverse posterior, almost crenulated.

ANALYSES OF THE SPECIES OF ZANCLOGNATHA.

1. Median lines dilated on the costa, forming more or less prominent triangular spots 2.
 Median lines uniform, not dilated on the costa..... 4.
2. Primaries with a brown or black patch at apex, following the subterminal line; costal patches at inception of median lines prominent; ground color luteous or brownish..... LITURALIS.
 Primaries without a dark apical spot; subterminal line simple or preceded by a dusky or blackish shade..... 3.
3. Ashen gray; the median lines slender, starting from obvious costal spots; transverse posterior line with an abrupt outward bend below the costa, close to and usually almost parallel with subterminal line THERALIS.
 Ashen gray; the median lines broad, somewhat diffuse, scarcely enlarged to form costal spots; transverse posterior line evenly outcurved, more remote from subterminal line, sinuate..... MINORALIS.
 Dull smoky gray or fuscous; median lines narrow, slightly enlarged at their inception; transverse posterior line sinuate..... INCONSPICUALIS.
4. Subterminal line sinuate; all the maculation distinct.
 Transverse anterior line rigid or with a slight inward bend; subterminal line not marked by preceding spots LEVIGATA.
 Transverse anterior line evenly outcurved; subterminal line lunulate as well as sinuate, preceded by a series of black spots, which are inwardly diffuse PUNCTIFORMIS.
 Subterminal line rigid or nearly so; pale..... 5.
5. Transverse lines broad, diffuse, contrasting; a black shade preceding the subterminal line ATRILINEELLA.
 Transverse lines slender, narrow, not contrasting..... 6.
6. Transverse anterior line even, not denticulate or marked on the veins, save that there may be an angulation over the costa..... 7.
 Transverse anterior line slender, irregular, dentate or outcurved in the interspaces..... 9.

7. Transverse posterior line even, not denticulate on the veins..... 8.
 Transverse posterior line irregular, slightly denticulated; ground color dark
 smoky; median lines obscure; subterminal line more contrasting....
 OBSCURIPENNIS.
8. Color pale luteous; transverse posterior line quite acutely angulated over
 the cell..... PEDIPALIS.
 Color darker, yellowish brown; transverse posterior line strongly bisinuate,
 outcurved but hardly angulated over the cell..... CRUEALIS.
9. Color yellowish to purple brown or smoky; smaller..... PROTUMNUSALIS.
 Larger; color smoothly luteous, scarcely powdery; lines indistinct or lost;
 subterminal line usually contrasting, pale, distinct, not preceded by
 a dusky shade..... MARCUDILINEA.
 Color luteous to ochreous, powdery; lines well marked; usually a dusky
 shading over the subterminal line and sometimes a distinct preceding
 dark line..... OCHREIPENNIS.

Zanclognatha lituralis, Hübner.

1818. Hübner, Zutraege, I, 9, fig. 19, 20, *Epizeuxis*.

1816. Hübner, Verzeichniss, 346, *Epizeuxis*.

1854. Guenée, Species General, Deltondes, 79, *Helia*.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 134, *Epizeuxis*.

1872. Zeller, Verh. k. k. Zool. Bot. Ges., XXII, 473, *Zanclognatha*.

1873. Grote, Trans. Am. Entomological Soc., IV, 306, *Megachyla*.

Ground color a rather even luteous brown, varying in shade to more luteous or more reddish, minutely powdery. Head and thorax concolorous. Primaries with the ordinary lines marked by brown, blackish, or black, quite prominent costal spots, but indefinite or obsolete below that point. Basal line marked only on costa by a single black line. Transverse anterior line prominently marked on the costa, but below that point traceable only by a few black scales and a small spot on the median vein, which is sometimes wanting. Transverse posterior line marked by a series of venular dots, accompanied by a vague, indefinite, paler shade. Subterminal line most prominently marked, pale, its course nearly straight; but the line itself is crenulated, the curves outward and usually filled inwardly by black dots, which are variably distinct, sometimes forming a quite obvious shade and occasionally disappearing altogether. A broken black terminal line, occasionally changing to lunules and sometimes almost disappearing. The apex is marked by an oval brown or black costal patch. Orbicular absent. Reniform a more or less prominent black lunule, distinct in all the specimens seen. Secondaries paler than the primaries, often shaded with blackish outwardly, crossed by an even, rather well-defined black shade line at the middle and a more irregular pale line toward outer margin. This latter line is marked in proportion to the dark shading of this part of the wing and is sometimes preceded by a blackish shade. There is also a narrow black terminal line interrupted on the veins. Beneath more powdery, the primaries smoky, darker through the center, with a dark discal spot, a distinct black extra median line and a pale subterminal line, the latter reproduced from upper side. The secondaries are more grayish, more powdery, the maculation of the upper side reproduced,

but much more prominently so. There is also a distinct black discal lunule. On both wings there is a series of terminal lunules.

Expanse of wings, 21 to 27 mm. = 0.85 to 1.12 inches.

HABITAT.—Canada to Florida and Texas; Central States; New York and Delaware in June; District of Columbia in August.

In the series of specimens before me there is little variation, except in size and intensity of the ground color. As the latter deepens the simple markings are more relieved, and in such cases we note a vague pale shade indicating the course of the ordinary lines. In one specimen, received from Mr. W. N. Tallant, Columbus, Ohio, the central space of the primaries is considerably paler than the other parts of the wing, and in a Delaware specimen the terminal space is quite obviously darkened.

In this species the lateral bristles of the male antennæ are well marked and quite long, and the thickening at basal third involves four joints. Of these, three bear stout spines inwardly; the two lower and shorter bear each of them two, of which that nearest the tip is stoutest, while the third and longer joint bears a single process basally. In the female the antennæ are clothed with rough scales and with scarcely prominent lateral setæ. The fore legs of the male are furnished with moderate tuftings only. The cavity of the coxa is filled by elongated scales. The femur contains no evident tuftings, while the tuft beneath the tibial process is sparse.

The species is the most common of those belonging to the first series and is represented in most collections. It is in this, also, that we find the most marked tendency toward a bunching of the veins, arising from the accessory cell of primaries.

Zanclognatha theralis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XIX, 855, *Hermia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 380, *Megachyta*.

deceptrialis, Zeller.

1872. Zeller, Verh. k. k. Zool. Bot. Ges., XXII, 473, *Zanclognatha*.

1873. Grote, Trans. Am. Entomological Soc., IV, 306, *Megachyta*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 380, pr. syn.

gypsalis, Grote.

1880. Grote, Bull. Bkn. Entomological Soc., III, 65, *Megachyta*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 380, pr. var.

Ground color ashen gray, variably black powdered. Head and thorax concolorous. Primaries with the ordinary lines marked and the median lines prominently dilated on the costa. Basal line marked on the costa only. Transverse anterior line usually distinct, single, almost upright, a little outwardly bent in the submedian interspace. Transverse posterior line single, black, slender, usually distinct, abruptly bent outwardly below the costal spot, thence crenulated and often irregular, yet as a whole nearly parallel with and close to the subterminal line. Subterminal line pale, distinct, quite rigid in course, minutely crenu-

lated, the curves directed inwardly, and the line preceded by a more or less well-marked black shade, which is always more distinct on the costa. A series of black terminal dots. Orbicular wanting. Reniform never well marked, blackish, indefinite, sometimes annular, never entirely wanting. Secondaries more thinly scaled and somewhat paler, crossed by an extra median dusky line, which becomes obsolete toward the costa, and by a pale extra median line, which is emphasized by a blackish preceding shade, most marked toward hind angle. Beneath whitish, powdery, both wings crossed by a fairly evident, sometimes prominent, extra median and a more faint, usually punctiform, outer dark line. A discal spot is also obvious on all wings.

Expanse of wings, 20 to 22 mm. = 0.80 to 0.88 inch.

HABITAT.—Nova Scotia to North Carolina, to Central States; New York and New Hampshire in June.

This species is much more rare than *Z. lituralis* and seems inclined to be more variable. The type of *Z. gypsalis* which I examined in the British Museum is a partially suffused specimen in which the base of the primaries is shaded with ochery and the subterminal and terminal spaces sprinkled with dark brown. It is not entitled to varietal rank, because the difference is rather in the nature of an aberration. The male antennae have the lateral bristles well developed and the thickening at the basal third well marked, chiefly by dense scales on the outer side. Two joints are furnished with stout, practically identical spurs, inwardly. The female antennae are feebly ciliated only. The fore legs of the male are prominently tufted. The coxa has only a few scattering hairs, and is not grooved; the femur is grooved on the upper side, has a tuft of scales at base and a pencil of long yellow hair attached at the tip. The tibial process is very broad and large, but covers a comparatively small tuft of hair, the tufting of the femur being in this case the most important.

Zanclognatha minoralis, new species.

Pale ashen gray, with fuscous powderings. Head and thorax concolorous. Primaries with the median space almost white, the basal space and all beyond the transverse posterior line with a fuscous washing. Basal line rather broad, diffuse, extending below the median vein. Transverse anterior line broad, diffuse, fuscous, somewhat dilated on the costa, in course with an even outcurve, and outcurved also between the veins. Transverse posterior line single, well defined, broad, scarcely if at all dilated on the costa, with small outward teeth on the veins; broadly outcurved over the cell and with a feeble incurve below. Subterminal line whitish, rather obscure, even, nearly straight in course, preceded by a fuscous shading. A series of lunate dusky terminal spots. Through the outer part of the median space is a vague, fuscous median shade, crossing the reniform. Orbicular wanting. Reniform distinct, rather small, oval, with a fuscous shading.

A somewhat diffuse, broad median band, followed by a subterminal abbreviated white line, which is preceded by a dusky shade, and is best marked toward the anal angle, becoming obsolete toward the costa. A distinct, blackish, interrupted terminal line, and a somewhat obscure discal lunule. Beneath, whitish, powdery, both wings with a distinct discal lunule and a broad extra median band; secondaries with an additional subterminal line, reproducing more distinctly that of the upper side.

Expanse of wings 21 mm. = 0.84 inch.

HABITAT.—Long Island, New York (probably).

The antennae of the male are lengthily bristled laterally, and the thickening at basal third is well marked, principally by the dense clothing of scales on the outer side, because only two joints are enlarged, and each of these bears a single, stout, pointed spine, somewhat curved at tip, and of these the basal is the weaker, though a little longer.

I have only two male specimens from the Michigan Agricultural College, without locality label of any kind, but probably from the Tepper Collection, and marked *M. deceptricalis*. It is not impossible that this is a form of *M. inconspicualis*, Grote, of which I have seen no male; but the differences are sufficiently great to induce its description at the present time, to call attention to the matter, though I would not have considered it advisable to name it under other circumstances. The course of the lines is practically like those of *M. inconspicualis*, but they are so much more prominent and so much more diffuse, while the coloration is so markedly different, as compared with its ally, that I hesitate to consider them identical without further material.

Zanclognatha inconspicualis, Grote.

1883. Grote, Canadian Entomologist, XV, 30, *Megachyta*.

Ground color an even, dull, smoky-brown or fuscous. Head and thorax concolorous. Primaries with basal line evident, narrow, extending to the median vein. Transverse anterior line blackish, narrow, somewhat dilated on the costa, curved in the interspaces, and with a slight general outcurve in its course as a whole. Transverse posterior line threadlike, blackish, somewhat dilated on the costa, denticulated on the veins, outcurved over the cell, and more or less incurved beneath. Subterminal line pale, variably distinct, its course nearly straight, with very small undulations, preceded by a variably marked blackish shade. Orbicular wanting. Reniform small, oval, blackish, not well marked. A broken, black, terminal line. Secondaries slightly paler, with a dusky median line; a pale or whitish subterminal line, preceded by a dusky shade, more evident near the anal angle, and an obscure discal lunule. Beneath gray, fuscous powdered, each wing with a dusky discal lunule, a dark extra median line, and a more or less obvious pale subterminal line.

Expanse of wings, 19 to 20mm = 0.78 to 0.82 inch.

HABITAT.—Mount Marcy, Adirondacks, New York, July.

The only specimens which I have seen are females, and all of those now before me were taken by the late Mr. W. W. Hill, in 1882, and are part of the lot from which Mr. Grote obtained his types. They are from the collections of the United States National Museum and Dr. J. A. Lintner, and I am not aware of other specimens, except in the Hill collection. It is quite probable that the species is locally common, and at all events I can testify to the abundance of small, obscure forms coming to light and stirred out of the scant vegetation near the top of Mount Marcy, where I spent a bitter cold night one August more years ago than I care to count.

The possible relation of this species to *Z. minoralis* has been already discussed.

Zanclognatha lævigata, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 95, *Herminia*.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39, *Zanclognatha*.

1878. Grote, Bull. U. S. Geol. Surv., IV, 186, *Zanclognatha*.
obsolata, Smith.

1884. Smith, Bull. Bkln. Entomological Soc., VII, 5, *Zanclognatha*.

Ground color varying from carneous gray to deep red, leather brown, or even blackish. Head and thorax usually of the palest color found on the primaries. Primaries with the transverse anterior line upright, or nearly so, varying somewhat in direction and sometimes with a small outward angulation on the subcostal. Transverse posterior line even, slender, with a bold outcurve over the cell and a small incurve in the submedian interspace. Subterminal line pale, slightly and irregularly sinuate, emphasized by a more or less marked preceding black shade, and sometimes followed in a similar way. A series of black terminal lunules varying greatly in distinctness and sometimes absent. Orbicular present as a distinct black spot in some specimens, entirely absent in others. Reniform always present, but varying from a distinct, black, kidney-shaped spot of good size to a slender indefinite dusky lunule. Secondaries varying from smoky gray to brown or blackish, with a dark extra median line, a pale subterminal line, a series of black terminal lunules, and a rather vague discal spot, which is sometimes wanting. Beneath, varying from smoky gray to red brown, powdery, with a common outer dark line and a discal lunule on all wings. In some cases there is also an incomplete subterminal line, best marked on the secondaries.

Expanse of wings, 27 to 32 mm.=1.10 to 1.32 inches.

HABITAT.—Canada to Southern and Central States; South Dakota; July to August.

It has been already indicated that this is an exceedingly variable species, and yet it is always readily distinguished, not only by the characters already given in the introductory remarks, but because it is really the only one of the genus with contrasting coloration. Ten

selected specimens before me exhibit a remarkable difference in appearance. Uniformly colored specimens are rare, and the extreme in this direction is the type of my *Z. obsoleta*, a Vermont specimen, which is almost uniformly blackish. In some specimens the median lines become diffuse, and the transverse anterior is most usually so modified. Sometimes the outer half of the median space is darker and sometimes the median space is uniformly in contrast with the basal and subterminal spaces, the terminal space often varying independently. Quite as usually we may have the median space lighter than any other parts of the wing, and this contrast is often very marked. The species is broader winged than any of its allies and has a somewhat more oblique outer margin and more perceptibly arched costa, differing, indeed, quite obviously from most others of its allies in these respects. It is quite common.

The antennae of the male are much as usual in the genus. They have long lateral bristles, a scaly thickening of the outer side at basal third, marked by a slight bend, and inwardly two of the joints are shorter, stouter, each furnished with a thick pointed spine somewhat curved at tip. Occasionally a third joint is involved and a third smaller spine is present. On all the joints at this point there are an unusual number of teatlike tubercles, some with and some without short hairs, and these are evidently sensory processes. They lessen in number in both directions from this point, but more gradually so toward the tip.

The antennae of the female are laterally ciliated.

The fore legs of the male are very prominently tufted and quite strongly modified. The coxa has a moderate tuft of long hairlike scales, those at base much the longest, then regularly becoming shorter to the tip. The trochanter is remarkably elongated and nearly equal to the femur. The femur is grooved on the upper side to receive a brush of hairlike scales nearly as long as femur and trochanter combined, and capable of being spread out fanlike. The tibial process is very large and clothed with dense, long scales, which do not, however, form distinct tuftings.

In the female the fore legs are quite normal and the trochanter is not in any way enlarged or elongated.

Zanclognatha punctiformis, new species.

Ground color an even, carneous gray. Head and thorax concolorous. Primaries with the maculation well defined. Basal line narrow, brown, marked on the costa only. Transverse anterior line narrow, brown, irregularly outcurved, and with uneven outcurves in the interspaces. Transverse posterior line narrow, brown, rather regularly bisinuate, a little marked, but hardly denticulate on the veins. Subterminal line sinuate, irregular, pale, innulate, the innules emphasized by a series of preceding black spots, which are inwardly diffuse. A series of black terminal dots on the veins. The outer part of the

median space is shaded with brown, the tint becoming obvious below the reniform. Orbicular wanting in the specimen. Reniform large, oval, brown, with a blackish defining line. Secondaries more luteous, paler basally, with a feebly marked, dusky extra median line, an irregularly dentate, pale subterminal line, preceded by darker-brown spots, and a narrow, black, interrupted terminal line. Beneath, all wings with a discal lunule, a dusky extra median line, and a pale subterminal line, which is preceded by a darker shading.

Expanse of wings, 29.5 mm. = 1.28 inches.

HABITAT.—District of Columbia.

A single specimen only, from the United States National Museum, "Collection C. V. Riley." The species very strongly resembles *Z. levigata* in general appearance, and with this it was associated in the Museum collection, though with a query. The specimen is defective and badly mounted, but seems to have been bred, and bears the number "2585, April 17, '82."

It is readily distinguished from *Z. levigata*, which it most resembles in superficial appearance, by the uneven transverse anterior line and by the characteristic, lunulate, pale subterminal line, emphasized as it is by the prominent preceding black spots.

The antennae of the male do not differ in any essential feature from those of *Z. levigata*, and there are two modified joints, with rather evenly curved stout spines, while the curve or bend in the antenna below the scaly thickening is slight.

The forelegs differ very decidedly, however, and first in the relative length of the trochanter, which is proportionately very much shorter and does not equal one-fifth the length of the femur. The tuftings seem to be much the same in character, but are much less prominent, the hair much less seal-like and not so much enlarged at the tips. The enlargement of the tibial process is much less evident, and indeed the entire foreleg is very decidedly shorter.

Zanclognatha atrilineella, Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 301, *Cleptomita*.

"Pale, testaceous, brownish. Primaries crossed by three black, broad, distinct lines. The transverse anterior even, perpendicular, broad. The transverse posterior narrow superiorly, exerted slightly beyond the disk, where it is slightly medially notched, more broadly marked below the submedian nervure, even. Subterminal line very broadly black, the subterminal space deepening in color to the line, followed by a very pale shade (as are the first two lines), even, a little inwardly arcuate, arising on costa before apex and reaching the internal margin within the angle. Terminally the wing is darker, more brownish. Hind wing a little paler, crossed by two ill-defined darker shade bands. On primaries a relatively large, rounded, black discal spot in the place of the reniform. Beneath paler, with double common lines, the subter-

minial marked toward costa on both wings and discal dots. Body parts rather pale."

Expanse of wings, 22 mm. = 0.88 inch.

HABITAT.—Texas, Belfrage, April 27.

The above is Mr. Grote's original description, and it agrees very well with a specimen in the collection of the American Entomological Society which is almost undoubtedly the type. Mr. Grote's description of the genus *Cleptomita* also agrees with the type, one fore leg of which is separated and mounted on a card labeled "*Cleptolita*" in his handwriting. Unfortunately, the description applies equally well to other species of *Zanclognatha*, and the characterization of the fore leg shows that Mr. Grote did not realize the nature of the structure examined. I have not seen a second specimen, and can add nothing on the structure of the antennae save that the male has the usual thickening one-third from base. The tuftings of the fore leg seem to be confined to the femur.

Zanclognatha pedipilalis, Guenée.

1851. Guenée, *Species General*, Deltoides, 57, *Herminia*.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 57, *Herminia*.

1872. Grote, *Trans. Am. Entomological Soc.*, IV, 96, *Herminia*.

1873. Grote, *Bull. Buff. Soc. Nat. Sci.*, I, 39, *Pityolia*.

Ground color a very pale, greenish, luteous gray, finely powdered. Head and thorax concolorous. Primaries, basal line absent in all the specimens I have seen. Transverse anterior line narrow, even, brown, with an easy outward angle on the subcostal and thence nearly upright or with only a feeble outcurve to the hind margin. Transverse posterior line narrow, even, brown, strongly exerted over the cell or sometimes subangulated, then inward and somewhat incurved to the inner margin. Subterminal line narrow, even, brown, often followed by a narrow, more or less complete pale line, extending from apex with a feeble incurve to the inner margin well within the anal angle and usually interrupted just below the apex, so the line proper seems to start from veins 7 and 8 and to have no connection with the apical mark. A slender, usually continuous, terminal line. Orbicular wanting. Reniform varying from a dot to a narrow dusky lunule. Secondaries paler, less densely scaled than primaries. There is a slender, threadlike, dusky extra median line, which is almost rectangularly bent near the anal angle. There is also a similar subterminal line, followed by a whitish shade, less abruptly bent, almost above the anal angle. A narrow, brown, continuous terminal line and a vaguely visible discal lunule. Beneath, more whitish gray, often with rather coarse, reddish powderings, with a common extra median dusky line, a similar subterminal line, followed by a paler shade and a dark discal lunule. The lunules and the outer line are variable and sometimes wanting on one or both pairs of wings.

Expanse of wings, 24 to 30 mm.=0.95 to 1.20 inches.

HABITAT.—Middle and Central States: Virginia, New York, and Missouri in June; Delaware in May; District of Columbia in August.

A very interesting and not uncommon species, which varies within narrow limits only. The ground color differs somewhat in intensity, the angle of the transverse posterior line is sometimes marked, sometimes rounded, and sometimes a broad curve; the subterminal line may be more or less abruptly terminated below the apex, and the wing form may be more or less pointed, or apparently so.

There can be no mistaking this form in any case, and the course of the subterminal line in the primaries is quite unique in the genus. I would have been strongly tempted to adopt Mr. Grote's genus could I have found any reasonably sufficient structural characters.

The antennae of the male are furnished with rather slender lateral bristles, and the enlargement at basal third is not prominent, the curve slight. Two joints are somewhat shortened and more robust, and are each furnished with an unusually long and slender pointed process.

The fore legs of the male are after the usual type. The coxa is slender, grooved above, with the cavity filled with elongated scales not forming a tuft or pencil. The trochanter is about one-third the length of the femur. The femur is furnished on the underside with elongated scales, massed at base into a loose tuft of a black color, but not forming anywhere a distinct pencil. The tibial process is large, and covers a very dense mass of elongated black scales, forming no obvious pencil, but giving the appearance of such at first sight. The species is thus characterized by a lack of distinct pencils of yellow hair and by the fact that the specialized clothing is on the under rather than the upper side of the femur.

***Zanclognatha cruralis*. Guenée.**

1854. Guenée, *Species General*, Deltoïdes, 58, *Herminia*.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 103, *Herminia*.

1872. Grote, *Trans. Am. Entomological Soc.*, IV, 97, *Herminia*.

1873. Grote, *Bull. Buff. Soc. Nat. Sci.*, I, 39, *Zanclognatha*
jachnsalis, Walker.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 104, *Herminia*.

1893. Smith, *Bull. U. S. Nat. Mus.*, 44, 382, pr. syn.

Ground color a rather dark luteous brown. Primaries with the usual lines well marked and even, not denticulate or crenulate. Basal line wanting in the specimens before me. Transverse anterior line distinct, brown, a little outcurved or bent on the costal vein, thence quite evenly or with a feeble outcurve, to the inner margin. Transverse posterior line slender, brown, broadly outcurved, sometimes subangulated over the cell and quite markedly incurved below; sometimes the line is quite evenly bisinuate. Subterminal line quite prominent, consisting of a narrow pale, preceded by a broader brown shade line, which occasionally absorbs its lighter companion. In course it is quite rigid from the

costa well before the apex to the inner margin well within the anal angle. A blackish, terminal, dotted line on the veins. Orbicular wanting; reniform small, a brown line or lunule. Secondaries somewhat paler than primaries, with a rather vague, often obsolete discal lunule, a somewhat indistinct extra median dark line, which is subangulate toward the inner margin, a more distinct subterminal brown, followed by a yellowish line, and a narrow, dark terminal line. Beneath paler, powdery, all wings with a blackish discal spot, a rather well-marked extra median line, and a variably distinct subterminal line, which is often followed by a pale shade line.

Expanse of wings, 25 to 28 mm. —1 to 1.12 inches.

HABITAT.—Nova Scotia to Virginia; Central States; New Mexico; New York; Illinois and District of Columbia, July and August.

The type of Mr. Walker's species is the same as the *Z. cruralis* of the Grote collection, which I believe to be correctly determined. The *Z. cruralis* of Walker is the *Z. larvigata* of Mr. Grote.

This species is quite common, and is very little subject to variation. In its markings it is very like *Z. pedipilalis* except as to the subterminal line, and it has the same tendency to form an angulation in the transverse posterior line over the cell. Small specimens which are a little rubbed may be easily confused with *Z. obscuripennis*, which differs mainly in the denticulated transverse posterior line.

The antennæ of the male are after the usual type; but the bend at basal third is much more prominent, and beyond it the joints are more slender than toward the base. Two joints are furnished with corneous processes which are very stout and pointed, and when at rest join at the tip so closely as to appear like a single heavy process at that point.

The fore legs of the male are well furnished with tufts. The coxa is grooved and furnished with an imperfect pencil of slender scales attached at and near the base. The trochanter is rather more than one-fourth the length of the femur. The femur is grooved on the upper side, furnished with a tuft of elongated black scales at the base, and at the tip with a pencil of long, flattened, yellow hair, which may be spread fanlike. The tibial process is very large and covers a dense mass of blackish scales which are elongated without forming a distinct brush or pencil, and are not capable of fanlike expansion.

Zanclognatha obscuripennis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 309, *Herminia*.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39, *Zanclognatha*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 382, *Zanclognatha*.

Ground color a purplish smoky brown, rarely varying to a reddish shade. Primaries with the maculation obscure. Basal line wanting. Transverse anterior line fairly distinct, bent over the costa and nearly straight below this point. Transverse posterior line slender, threadlike, obscure, often partly obsolete, more or less obviously but always

feebly denticulate; in course, bisinuate, outcurved over the cell, incurved beneath. Subterminal line rigid, pale, preceded by a brown shade which is inwardly diffuse. A series of black, venular, terminal dots. Orbicular wanting. Reniform a very obscure dusky lunule, which is sometimes barely traceable. Secondaries more powdery and somewhat paler than primaries, with an obscure dusky extra median line and a more evident, sometimes even well-marked, pale subterminal line. There is also a slender dark terminal line, followed by a yellowish line at the base of the fringes, and occasionally a vague discal lunule. Beneath, more gray and quite coarsely powdery. All wings with a discal spot, a well-marked extra median line, and a variably distinct pale subterminal line, which is more frequently wanting on the primaries.

Expanse of wings, 21 to 25 mm. = 0.84 to 1 inch.

HABITAT.—New York to Alabama; District of Columbia, in August.

This, so far as the specimens before me indicate, is a very constant species, liable to be confused with *Z. cruralis* and *Z. minimalis*. From the latter it differs in the rigid transverse anterior line; from the former in the purplish ground color and generally obscure maculation, the transverse posterior line tending to become obsolete, while it is usually somewhat irregularly, though feebly, denticulated. The subterminal line is preceded by a brown shade, rather than a line, and these characters, with the decidedly smaller average size will enable the species to be recognized in most instances. Most of the specimens before me are from the United States National Museum, "collection C. V. Riley," and bear his record number, 2807, and dates ranging from August 7 to 17.

In the structure of the male antennæ and fore legs this species resembles *Z. cruralis* closely, and in the latter character indeed no essential difference has been noted. The characters of the antennæ are somewhat intensified, however—that is, the bend is more marked, the joints beyond more slender, while the corneous processes are heavier, and a third joint is often involved, also furnished with a process. Otherwise no notable difference has been made out.

Zanclognatha protummosalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 104, *Hermia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 383, *Zanclognatha*.

minimalis, Grote.

1878. Grote, Bull. U. S. Geol. Surv., IV, 186, *Zanclognatha*.

1891. Smith, List Lepidoptera, 63, pr. syn.

1893. Smith, Bull. U. S. Nat. Mus., 44, 383, pr. syn.

Ground color varying from luteous to purplish smoky brown. Head and thorax concolorous. Primaries with all the maculation usually obscure. Basal line traceable on the costa in some specimens, usually obsolete. Transverse anterior line slender, brown, evenly but not strongly outcurved, with moderate outward angulations between the

veins. Transverse posterior line slender, brown, slightly more marked on the costa, as is also the transverse anterior line; in course somewhat irregularly bisinuate, more or less distinctly, but always obviously, denticulate on the veins. Subterminal line rigid, pale, more or less marked, rarely conspicuous, not defined by darker line or shade. A series of black, venular, terminal dots. Orbicular wanting. Reniform an oval, more or less obscure blackish spot. Secondaries pale, dirty luteous, powdery. A vague, extra median dark line, which is sometimes obsolete; and a better marked, sometimes quite prominent, pale subterminal line, in continuation of the corresponding line of the primaries. A broken, blackish, terminal line. Beneath paler, more gray, powdery; all wings with a discal spot, a dusky extra median and pale subterminal line, varying in prominence and sometimes almost immaculate.

Expanse of wings 24 to 26 mm. = 0.96 to 1.05 inches.

HABITAT.—Canada to District of Columbia; New York in July.

This species is quite usually confused with *Z. obscuripennis* or even *Z. eruralis*, differing from both by the angulated transverse anterior line of the primaries. I have only five specimens before me, from as many localities, indicating rather an uncommon form. Of these, four are luteous, like the types in the British Museum, and differ only in the relative prominence of the reniform; while one specimen without definite locality, but probably from Long Island, N. Y., is of a very decided purplish brown, with a strongly contrasting subterminal line. It is possible that we have to do here with a different species, but the material is not sufficient to decide the question. As has been indicated, the types of *Z. protumnalis* and *Z. minimalis* are of the luteous form.

In the male characters this species is very like *Z. obscuripennis*, especially in the antenna, in which three joints are quite generally furnished with corneous processes, the third or upper decidedly smaller than the others.

Zanclognatha marcidilinea, Grote

1872. Grote, Trans. Am. Entomological Soc., IV, 93 and 309, *Herminia*.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39, *Zanclognatha*.

Ground color luteous, with fine, even, ochereous powderings. Head and thorax concolorous. Primaries with the median lines very slender, tending to obsolescence. Basal line wanting. Transverse anterior line quite evenly outcurved and with moderate outcurves in the interspaces. Transverse posterior line irregularly bisinuate, with moderate denticulations on the veins. Subterminal line pale, rigid, not defined by dark lines or shades. A series of venular black terminal dots or humules. Secondaries paler than the primaries, with a very feebly marked, dusky, extra median line, and a more distinct, pale subterminal line. An interrupted brown terminal line. Beneath pale, luteous gray, with ochereous powderings. All wings with a discal spot, a brown extra median and a pale subterminal line, and all variably evident, sometimes nearly obsolete.

Expanse of wings, 25 to 30mm. = 1 to 1.20 inches.

HABITAT.—Northern, Middle, and Central States, south to Alabama; New York, July to September; Delaware in July.

The antennae are longer and more slender than in the species immediately preceding, and more as in *Z. lwigata* and *Z. pedipilalis*; the lateral bristles longer and more slender. The bend at the basal third is well marked, and two joints are furnished with processes which are curved and pointed at tip. The tuftings of the fore legs are prominent. The coxa has a pencil of hair-like scales attached near base. The trochanter is one-third as long as the femur. The femur has a tuft of elongated black scales at base and a pencil of yellow, hair-like scales attached at tip and capable of fanlike expansion. The tibial process is large, and the scaly clothing is dense, forming no distinct pencils.

Zanclognatha ochreipennis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 98, *Hermia*.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39, *Zanclognatha*.

Ground color luteous with dense, coarse, ochereous powderings. Head and thorax concolorous. Primaries with the median lines brown, usually well marked and broad. Transverse anterior line outwardly convex as a whole, with variably marked outcurves in the interspaces. Transverse posterior line irregularly bisinuate, outwardly denticulate on the veins. Subterminal line rigid, pale, usually prominent, generally defined by a preceding brown shade line, which occasionally forms the more obvious portion of the line. A series of black terminal lunules or dots on the veins. Secondaries pale luteous gray to smoky, with a variably defined, sometimes quite distinct, extra-median dark line, and a distinct, sometimes prominent, pale subterminal line, which is often preceded and defined by a darker shading. A black or brown, interrupted, terminal line. Beneath, paler, coarsely powdered, all wings with a discal spot, a dark extra-median and pale subterminal line, the latter sometimes preceded by a darker shade line.

Expanse of wings, 27 to 32mm = 1.10 to 1.30 inches.

HABITAT.—Canada to Virginia; Central States; Colorado. Canada in July; New York, July to September; Illinois, July and August; District of Columbia in August.

This species and *Z. marcidilinea* are very unsatisfactorily distinguished; yet they seem to be good species. Such differences as exist are comparative, and are obvious only in fairly good specimens, becoming more or less lost when they are rubbed. As a whole, *Z. marcidilinea* averages smaller, is much more even in color, with less tendency to ochereous; the median lines are decidedly narrower and much less distinct, tending even to obsolescence, particularly in the transverse posterior line; and the subterminal line is rarely defined by a darker shade line. *Z. ochreipennis* is coarsely powdered as a rule, of a brighter, more intense ground color, varying to a much darker shade; quite usually becoming darker terminally and relieving the more prominent

subterminal line, which is frequently preceded by a dark line. The median lines are not thread-like, are usually well marked, and obscured only in very dark specimens. Yet withal the differences are unsatisfactory, and structural characters do not help us much.

The forelegs are practically as in *Z. marcidilinea*, save that the trochanter is somewhat shorter and about one-fourth the length of the femur. The antennæ are somewhat shorter and stouter, and there is often a third joint furnished with a spinous process. Else I find no notable differences.

Genus *HORMISA*, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 71.

Litognatha, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 85.

Pallachira, Grote

1877. Grote, Canadian Entomologist, IX, 197.

Sisyrhyppena, Grote.

1873. Grote, Canadian Entomologist, V, 227.

Eyes naked, large, globose. Front smooth, in perfect examples with a pointed tuft between the antennæ; but this is a variable and often defective feature. Tongue moderate. Antennæ moderate in length, arising from the vertex close to the compound eye, the basal joint enlarged in the male, less prominent in the female. In the male the antennæ are bipectinated, a single branch on each side of each joint, except that at the inner side, for one-third from base, the pectinations are wanting. At this point two or three joints bear specialized corneous processes similar to those in *Zanclognatha*, and beyond it the antennæ are normal. In the female the antennæ are simple, with slight lateral ciliations, the ciliations apparently arising from alternate joints only. The palpi are sickle-shaped, curving upward and distinctly exceeding the vertex, in essential character like *Zanclognatha*. Ocelli distinct, close to the compound eye, and also close to the base of the antenna. The body is slight, untufted, the abdomen cylindrical, exceeding the anal angles of the secondaries. Legs long, quite robust, the posterior being most developed and much the longest, without armature other than the usual spurs of middle and posterior pairs.

In the male the anterior tibiæ are remarkably modified. All the parts are elongated and tufted, the trochanter is excessively developed in all the species, the tibia is an abortion, and the tarsi are obsolete in some species. The tibial process is the most prominent part of the leg and covers a mass of specialized, blackish scales.

The wings are moderate and proportionate, the primaries, except in *H. orciferalis*, trigonate, with marked or even pointed apices; in the latter subequal, with obtuse or rounded apex.

Mr. Grote's name, *Litognatha*, must yield to the earlier term used by Walker, and in the above definition are also included Mr. Grote's genera *Pallachira* and *Sisyrhyppena* as well as *Hormisa* proper. For *Pallachira*

there is no base except the longitudinally strigata markings of the wings; but in *Sisyrrhynena* the wing form and color give the species quite a distinct appearance which is not borne out by the more essential characteristics. The genus differs from *Zanclognatha* mainly in having pectinated antennae in the male, and by the more complete abortion of the male fore legs. Otherwise the essential characters are much the same.

The species are not closely allied and are separable with ease. *H. absorptalis*, or *nubilifascia*, as it is more usually labeled, is the largest, the wings broader than in its allies, and the transverse posterior and subterminal lines are marked by prominent, preceding, brown shades, which are diffuse inwardly.

H. litophora is smaller, and the wings are narrower and more pointed than in its allies. The median lines are narrow and thread-like, not emphasized in any way, and the subterminal line is barely traceable or entirely obsolete.

H. bivittata nearly equals *H. nubilifascia* in size, but is narrower winged and with a somewhat less prominent apex. It lacks all the transverse lines, but has a broad, velvety brown longitudinal streak through the submedian interspace, and a short brown streak beyond the cell, not reaching the outer margin.

H. orciferalis is quite unlike all the others, which are luteous or whitish, in the blackish smoky ground color, on which all the markings are obscure, and in the subequal primaries, which have the apex obtusely rounded.

The species are few in number and widely distinct. None of them are common, though *H. nubilifascia* is not rare.

Litognatha linearis, Grote, does not belong to the genus, nor, indeed, to this series; that is, it is not a Deltoid at all.

ANALYSIS OF THE SPECIES OF *HORMISA*.

Transverse lines distinct; color luteous; no longitudinal streakings.

Larger; all the lines prominent, the transverse posterior and subterminal marked by brown preceding shades *ABSORPTALIS*.

Smaller; median lines narrow and threadlike; subterminal line scarcely traceable; no brown shadings *LITOPHORA*.

Transverse lines obsolete; color luteous; two prominent black longitudinal streaks, *BIVITTATA*.

All markings obscure; color smoky or blackish; one darker longitudinal streak faintly marked in most specimens *ORCIFERALIS*.

Hormisa absorptalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 74, *Hormisa nubilifascia*, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., 1, 85, pl. 2, figs. 2, 3, *Litognatha*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 380, pr. syn.

Ground color a pale luteous or dirty yellowish gray, with fine black powderings. Head and thorax concolorous. Primaries with a brown-

ish shade on the costa. Transverse anterior line slender, even, brown, widely outcurved and outwardly angulate in the interspaces. It is rarely distinct and sometimes entirely wanting. Transverse posterior line broad, brown, inwardly diffuse, widening to the hind margin. It is outwardly bent on the costa and then runs rigidly oblique inwardly, reaching the hind margin at its middle. A paler shade following the line, quite marked in some specimens, merging insensibly into the ground color, which in turn darkens to the rigid brown subterminal line, which runs from the apex without curve or bend to the inner margin, well within the anal angle, and is followed by a somewhat defined pale line. A continuous brown terminal line, followed by a yellow line at the base of the fringes. Orbicular wanting. Reniform indicated by two black dots at the end of the cell. Secondaries paler, with a dusky median line, and a pale external line which is somewhat irregular and is preceded by a brown shade. Beneath, darker, with dense, coarse, ochereous brown powderings. There is a distinct, broad, common median line, and a less evident pale subterminal line, which on secondaries is often preceded by a dusky shade. All wings with a discal spot.

Expanse of wings, 24 to 26 mm.=0.96 to 1.05 inches.

HABITAT.—Canada, south to Virginia; west to the Mississippi States. New York in July.

This is the most common of the species, and always easily recognized by the brown shaded transverse posterior and subterminal lines. There is very little variation, and this chiefly in the relative distinctness of the transverse anterior line.

The antennæ of the male have been generally described under the generic heading. The pectinations are long, and from most of them there arises near the tip a long slender bristle, which replaces the pectinations inwardly at the basal third. At this point two joints bear each a stout corneous process, and next to each a stiff bristle or spine. The pectinations are ciliated, the hair very fine and moderate in length on the inner underside. Just below the pectination on that side is also, on each joint, a short chitinous process, bearing in a pit a short stout bristle or spine.

The fore legs of the male are extremely modified. The coxa is long, grooved, furnished with long hair, forming no tufts or pencils. The trochanter is shorter, but nearly double the length of the femur. The latter is short and stout, with a circular disklike enlargement at base of underside, which is furnished with coarse pittings and with long black specialized scales. On the upper side it is fringed with similar longer hair and scales, forming no tufts. The tibia is reduced to an oval mass of scales covered by a chitinous shell, and the tarsi are rudimentary, almost completely aborted. The legs furnished with these structures have, of course, entirely lost their normal function as organs of locomotion, and are examples of modification run riot.

Hermisa litophora, Grote.1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 86, *Litognatha*.1893. Smith, Bull. U. S. Nat. Mus., 44, 380, *Hormisa*.

Ground color pale grayish yellow or luteous. Head and thorax concolorous. Primaries with costa and fringes brownish. Transverse anterior line slender, even, brown, a little outcurved below the costa; thence evenly oblique to the hind margin. Transverse posterior line slender, brown, even, strongly outcurved over the cell, then inwardly oblique and with a slight incurve to the hind margin about two-thirds from base. Subterminal line vaguely indicated by a few brown scales. A narrow line at the base of fringes. Orbicular marked by a black dot on the transverse anterior line. Reniform marked by two black dots at the end of the cell. Secondaries paler, almost immaculate; a vague darker median line and a mere trace of an outer or subterminal line. Fringes brown with a somewhat metallic reflection, as has also the fringe of primaries. Beneath paler, with dense ochereous powderings, with a common median line, which is crenulate and broader on the primaries, where it becomes also more even toward the costa.

Expanse of wings, 23 mm. = 0.92 inch.

HABITAT.—Middle and Central States.

This is smaller and narrower winged than *H. absorptalis*, the primaries somewhat more pointed or drawn out apically. The body is slight, pyralidiform, and the abdomen considerably exceeds the anal angle of the secondaries. The species is rare, and I have seen very few specimens, showing no variations.

The male antennæ are in type as in the previous species; but there are four modified joints, more or less lamellate, and one of these, the upper, is furnished with a stout and rather long chitinous spine; the scaly clothing being also more dense and prominent.

The fore legs of the male are essentially as in *H. absorptalis*, except that the tarsi are not quite aborted. The basal joint is very long and stout, though a mere shell, the three ensuing joints are minute, but the fourth is enlarged, somewhat bulbous, with quite prominent, toothed claws. Abortion is not carried quite so far here as in its ally; but the curious tarsal modification is as interesting as the complete absence of this feature.

Hormisa bivittata, Grote.1877. Grote, Canadian Entomologist, IX, 198, *Pallachira*.

"Entirely pale ochery, powdered with fuscous. A broad fuscous stripe below median vein from base to external margin. A second, shorter stripe, from the extremity of the cell outwardly. Else the entire insect is concolorous."

Expanse of wings, 25 to 26 mm. = 1 to 1.05 inches.

HABITAT.—Canada; Northern, Middle, and Central States; Iowa. New York in July.

A rare species, of which I have only a female at hand. I have seen the male, however, and find it fully congeneric with *H. absorptalis*; indeed, Mr. Grote's generic description of *Pallachura* is in all essentials like that given by me for *Hormisa*.

The species can not be mistaken for any other in the entire Deltoid series represented in our fauna. The specific description is copied from Mr. Grote's original characterization, and is ample for the definition of this simply marked form.

***Hormisa orciferalis*, Walker.**

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 235, ? *Hormisa*.

1859. Walker, Cat. Brit. Mus., Heterocera, XIX, 876, ? *Epizenis*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 386, *Sisyrhyppena*.

pupillaris, Grote.

1873. Grote, Canadian Entomologist, V, 227, *Sisyrhyppena*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 386, pr. syn.

hartii, French.

1894. French, Bull. Ills. State Lab. Nat. Hist., IV, 10, *Pallachura*.

“Male. Concolorous, silky drab, veins tending to be paler marked. Primaries with diffuse darker terminal shading, and a discal, narrow, outwardly extended streak. An exceedingly fine and faint outer transverse line, rounded opposite the discal cell. A subterminal oblique punctiform line from apices to internal margin within the angle. Costal margin dark shaded. The discal dots are perceivable against the longitudinal discal streak. Hind wings a little paler, with a very faint transverse shade line. An interrupted fine dotted line before the silky fringes on both wings. Beneath darker; the hind wings much clouded with dark brownish, with a distinct discal spot and a continued transverse guttiform or cuneiform subterminal line, analagous to the subterminal line of the fore wings above; faint traces of an inner transverse line. Fore wings without markings except an incomplete reproduction of the subterminal shaded apices. Body parts concolorous; abdomen like hind, thorax like fore wings.”

“Female. The labial palpi are held as in the male, but the third article is more pointed. Slighter than the male, with simple antennae and with almost wholly blackish brown primaries. The male exhibits two transverse lines, while both female specimens have entirely glossy brown fore wings without apparent marks except the inconspicuous discal points. Hind wings pale drab, with faint darker terminal shading. Beneath, the secondaries have the double lines more equally defined. Thorax and head dark, concolorous with primaries.”

Expanse of wings, 21 to 23 mm. = 0.85 to 0.90 inch.

HABITAT.—Texas, Florida, Southern States; Illinois; Philadelphia.

The above is Mr. Grote's original description, which is applicable to the types and to most of the other specimens seen by me. A male example from Florida, now before me, is considerably darker, smoky, almost blackish. I have seen this species only rarely, and never from

any point so far north as Philadelphia, from which one of Mr. Grote's specimens is credited.

The male antennæ have the pectinations well marked and laterally ciliated, furnished near tip with a long bristle, and toward the apex the branches become clavate or somewhat enlarged, clublike. At one-third from base a single joint is inwardly furnished with a single corneous process, accompanied by a stiff bristle, and in all essentials the member agrees with the genus to which it is referred.

The anterior leg of the male is like that of *Litophora*, save that there are no tuftings. The sensitive space on the under side of the femur is more protuberant, rounded, and fits quite closely against the tibial epiphysis, which in turn fits into the greatly developed tibial process, forming an oval mass beyond which the four rudimentary tarsal joints project. In this oval mass are concealed the specialized scales which nowhere develop into pencils of hair.

Except for the wing form, this species agrees in all its essential features with the other species of the genus to which I have referred it. The apices here are usually as distinctly rounded as they are pointed, or at least rectangular, in the other forms; but the difference is hardly greater than that found among the species of *Zanclognatha*, and I have not deemed it well to disassociate it. The palpi show a tendency to an upright scaling of the upper edge; but not more marked than in some specimens of *H. absorptalis*.

Professor French's type of *Pallachira hartii* I have seen by the courtesy of Professor Forbes. It is typical *H. oreiferalis* and agrees fully with Mr. Grote's description of male *H. papillaris*. Professor French allowed the obvious resemblance to *Pallachira bivittata* to delude him into the belief that it could not have been described under another generic name.

Genus PHILOMETRA, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 99.

Eyes naked, large, globose. Front smooth, in perfect specimens with a pointed tuft between the antennæ. Tongue moderate. Antennæ long, arising from the vertex close to the compound eye, the basal joint somewhat enlarged in the male. In the male the antennæ are lengthily bipectinated in their entire extent, the branches slender and setose, and there is no special modification. In the female the antennæ are shorter, simple or sparsely ciliated. Ocelli distinct, close to the compound eye, well removed from the base of the antennæ in *P. eumelusalis*, quite closely approximated in *P. metonalis*. Palpi long, the second joint much the longest, clothed with upright scales above and on the side, forming a sharp ridge which in *P. metonalis* is equal and continuous, but in *P. eumelusalis* is more prominent centrally. In the former the palpi are directed straight forward, the terminal joints diverging at tip, while in the latter they diverge from the base and are curved obliquely

upward, but not sicklelike, nor backward. The body is moderate or slight, the abdomen cylindrical, subequal, reaching to or slightly exceeding the anal angle of secondaries. The wings are large, trigonate, wide, with arched costa, rectangular apices, and evenly curved outer margin. Venation normal. Legs long and quite robust, without armature, save the usual spurs of the middle and hind tibiae, and these are long and unequal.

In the male the modification is quite different in the species. In *H. metonalis* it resembles that usual in *Hormisa*, while in *H. eumelusalis* the tuftings equal or exceed in prominence any found in *Zanclognatha*.

The essential characters of the genus are the lengthily and evenly pectinated antennæ of the male combined with the palpal structure and broad rounded wings.

The two species referred to here are so similar in type of maculation that, when rubbed, there is sometimes a question as to species, and yet they are quite strongly distinct, structurally. The difference between the palpi was pointed out by Mr. Grote; that between the forelegs of the male seems to have escaped him.

P. eumelusalis, which may be considered the type of the genus, is larger in average expanse and darker, the luteous ground strongly powdered with brown scales, which form a rather distinct, though diffuse, median band, and a quite marked shade preceding the subterminal line. The median lines, on the other hand, are vague and obscure.

In *P. metonalis* the ground color is paler and much more even; the median shade, when visible, as it usually is, only a little darker, while the subterminal shade is barely traceable in most instances. The median lines, however, are usually distinct, though narrow and thread-like, and are more even than in its ally.

Further differences will appear in the detailed descriptions of the species, neither of which is rare.

ANALYSIS OF THE SPECIES OF PHILOMETRA.

- Palpi directed straight forward, diverging at tip; antenna of male lengthily bipectinated, the branches slender, setose.....METONALIS.
 Palpi directed obliquely upward, diverging from base; antenna of male bipectinated, the branches stout, with stout, long bristles near tip.....EUMELUSALIS.

Philometra metonalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 236, *Herminia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 383, *Philometra*.

gaosalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XIX, 876, *Epizenxis*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 383, *Philometra*.

longilabris, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 99, 309, *Philometra*.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 40, *Philometra*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 383, pr. syn.

Ground color a pale luteous, powdered with darker scales. Head and thorax concolorous. Primaries with the markings evident, though not prominent, without contrasting shades. Basal line vaguely marked in some specimens. Transverse anterior line slender, brown, rarely indistinct, slightly outcurved, a little drawn in on the median vein. Transverse posterior line slender, somewhat dilated on the costa, regularly and somewhat variably outcurved over the cell, and rather evenly oblique or with a small incurve below. Subterminal line vague, marked as a somewhat diffuse, indefinite dusky shade, which is sometimes scarcely traceable and sometimes fairly marked, occasionally forming a dusky apical spot. Through the outer portion of the median space is a broad, diffuse, often indistinct, always indefinite, darker, brown shade band, involving the slender lunule which represents the reniform. Orbicular wanting, or marked only by a small dot on the transverse anterior line. A slender, dark, continuous terminal line, followed by a more or less obvious pale line at the base of the fringes. Secondaries paler, sometimes whitish, with a darker median line, most evident in pale specimens, and an incomplete outer pale line, defined toward the inner margin by a preceding dusky shade. Beneath, with coarse, ocherous powderings, with a distinct, brown common extra-median line and a distinct discal dot on all wings.

Expanse of wings, 21 to 26 mm. = 0.85 to 1.05 inches.

HABITAT.—Nova Scotia, southward to Virginia; Central States; New York in June, July, and August.

The species is not rare, and varies within narrow limits only. The ground color may be somewhat lighter or darker, and the powdering more or less evident, and as the specimens are darker the lines are less distinct and the median shade band becomes more obvious; and such specimens, when imperfect, may be confused with *P. eumelusalis* if the structural characters are not looked to. The palpi have been already referred to, and it is a matter of regret that Mr. Grote's expressive name could not have been retained.

The male antennae are lengthily bipectinated, the branches slender, setose, the surface imbricated very much as in the *Aphididae*, becoming shorter and somewhat clavate toward the tip; not furnished with a longer terminal bristle. In the female the joints are shorter and are feebly ciliated.

The fore legs of the male are much as in *Hormisa*. The coxa is long, furnished with an imperfect scale tuft at the apex. The trochanter equals the femur in length. Femur rather stout, with a diffused sensitive surface beneath, and long, specialized scales, not forming tufts. The tibia consists mainly of epiphysis and process, forming a sort of pouch concealing long specialized scales, and concealing all save the terminal joint of the tarsi.

In the fore wings examined, vein 10 arises from the accessory cell near its tip, independent of 8.

Philometra emelusalis, Walker.1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 105, *Hermia*.1891. Smith, List Lepidoptera, 63, *Philometra*.*serraticornis*, Grote.1872. Grote, Trans. Am. Entomological Soc., IV, 98, 309, *Philometra*.1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 40, *Philometra*.

1891. Smith, List Lepidoptera, 63, pr. syn.

Ground color luteous, with blackish and brown powderings. Head and thorax concolorous. Primaries with the powderings dense, though irregularly distributed, giving the wings a peculiarly sordid or dirty appearance. Basal line faintly marked in some specimens. Transverse anterior line blackish, rarely distinct, often diffuse and undefined, with two even outcurves in its course. Transverse posterior line slender, irregular; a little marked on the veins, irregularly outcurved over the cell, somewhat incurved beneath; often diffuse and sometimes almost obsolete, except on the costa, where it is somewhat dilated. Subterminal line irregularly sinuate, pale, marked by a more or less distinct apical blotch and preceding shade, which becomes inwardly diffuse and sometimes darkens a large part of the subterminal space. A narrow, black, interrupted terminal line. A broad, diffuse, undefined, almost upright, smoky median shade, involving the reniform, which is usually a narrow lunule, but sometimes a more prominent oval, though not defined, blotch. There is sometimes a vague trace of an orbicular. Secondaries paler, varying in shade, always powdery, with an undefined median shade line, more obvious in pale specimens, and an incomplete subterminal line, which is pale and preceded by a dark shade toward the hind margin; occasionally this line is complete, and then the terminal space is somewhat paler than the rest of the wing; beneath brighter yellowish, with ochreous powderings. There is a distinct, common, brown median line, a distinct discal lunule, which on the secondaries is sometimes faintly visible on the upper side, and a vague, incomplete outer line.

Expanse of wings, 25 to 30 mm.=1 to 1.20 inches.

HABITAT.—Canada to Virginia, west to Iowa; South Dakota, June and July.

The species is common and varies little. It is usually a question of a more or less dense dark powdering and the corresponding obscurity of the ordinary lines.

In the male the antennæ are bipectinated, the processes long, somewhat enlarged toward the tip, near which is inserted a long, curved bristle, the surface smooth, without scaly markings, but with obvious pittings, and they are quite abundantly setose.

The fore legs of the male are quite different from the preceding species. The coxa is long, slender, and with a pencil of scale-like hair at its tip. The trochanter is long, scarcely shorter than the femur. The femur is stout and on the under side furnished with a dense pencil

of long black hair, capable of fanlike expansion. The tibia is nearly all process, the epiphysis small, the outer shell covering a dense tuft of blackish hair and scales, capable of loose brushy expansion, and these scales extend beyond the chitinous structure and conceal the remnant of the tarsus which is almost aborted.

In the specimens examined of this species, the accessory cell of primaries gives rise at its tip to 7 and a long stalk, from which arise 8, 9, and 10.

The structural differences between the two species referred here are greater than in any other genus in the series, and withal the superficial resemblance is quite marked.

Genus **CHYTOLITA**. Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 309.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39.

Herminia, Guenée.

1882. Smith, Bull. Bkln. Entomological Soc., V, 4.

Eyes naked, moderate, globose. Front smooth, with a pointed tuft between the antennae. Antennae long, inserted on the vertex, close to the compound eye. In the male the joints are marked, heavily scaled, with long lateral bristles, and at basal third are two or three joints that are thickened and furnished with, each, a stout corneous process, the third when present always smaller than the others, and, in fact, merely a somewhat shorter and stouter lateral bristle. In the female the joints are very slightly marked and are furnished with small lateral bristles. The ocelli are prominent, set close to the compound eye, moderately removed from the base of the antennae. Palpi long, straightly projected forward or directed obliquely upward, the second joint extremely long, the third short and set in at an upward angle to the second. The second joint is clothed with upright scales, forming a ridge or edge, or, as the Germans render it, "schneidig beschuppt," and this scaly clothing is nearly equal throughout, shortening only at extreme base. Body moderate, untufted, abdomen smooth, cylindric, reaching to or slightly exceeding the hind angle of secondaries. Legs long and moderately stout, spurs of the middle and hind tibiae long, unequal. Fore legs in the male very much elongated and prominently tufted. The coxa is very long and furnished with very long yellow hair, longest toward base, forming a somewhat imperfect tuft. Trochanter comparatively short. Femur stout, furnished at tip of upper side with a pencil of very long yellow hair, capable of fan like expansion. Tibia aborted, the epiphysis small, the process well developed and covering the basal joint of tarsi, concealing also a mass of specialized scales. The tarsi have the basal joint very long, the others normal. In the female the fore legs are normal. The wings are large, the primaries trigonate, with somewhat produced or rectangular apices and oblique, evenly curved outer margin.

Two species have been described in this genus, referred in my catalogue to *Herminia*. In substituting Mr. Grote's genus for these species and omitting *Herminia* altogether from the list of our genera, I have been decided by the lack of European material and the present difficulty in getting at the type of the genus out of the mass of European works that are not conveniently accessible to me here.

Lederer defines *Herminia* as being like *Zanclognatha*, but with the palpi different, and he makes three sections: the first with pectinated male antennae, furnished with a knotted thickening in the center and the fore legs with brushes of hair, including *H. crinalis*, *H. gryphalis*, and *H. cribralis*; the second with antennae as before, but the fore legs without pencils of hair, including *H. tentacularis*; the third with the male antennae having lateral bristles only, without thickening at the middle, and no statement concerning the fore legs, *H. derivalis* being the sole species.

Guenée makes his genus *Herminia* comprise species of *Zanclognatha* as well as *C. morbidalis* of the present series and the *Herminia* of Lederer, refusing to consider any of the genera separated as valid. Mr. Grote in 1873 analyzed the European species and genera¹ and concluded that *H. tentacularis* should be considered as type, and if this is to be followed we have no species referable to *Herminia*, because none of our forms have pectinated antennae thickened near the middle, without modified fore tibiae in the male, combined with the peculiar palpal structure. In view of my inability to study the European forms at present, I have accepted Mr. Grote's conclusions, and hence his genus, *Chytolita*.

The two species referred here differ mainly in size, *C. petrealis* being the smaller. In the very large series before me I am unable to find a single constant difference in maculation, and the color of *C. petrealis* can only be said to be darker in a general way. The difference in the palpi pointed out by Mr. Grote is also inconstant, though in *C. petrealis* more specimens have them straight than is the case in *C. morbidalis*, and the latter may be said to have a tendency to have them curved upward. The difference in size, on the other hand, seems to be constant, and it is accompanied in *C. petrealis* by a more than proportionate difference in the antennae, where the lateral bristles are much weaker, and in the fore legs, where the member is much smaller than in *C. morbidalis*.

There is a hardly marked difference in the male genitalia, which will be described under the specific headings.

ANALYSIS OF THE SPECIES OF CHYTOLITA.

Size larger, average 32 mm.; color paler; fore leg of male proportionately large	MORBIDALIS.
Size smaller, average 27 mm.; color darker; fore leg of male half the size of <i>C. morbidalis</i>	PETREALIS.

¹ Bull. Buff. Soc. Nat. Sci., I, 39, 1873.

Chytolita morbidalis, Guenée.

1854. Guenée, Species General, Deltoïdes, 56, pl. 6, fig. 3, *Herminia*.
 1859. Walker, Cat. Brit. Mus. Heterocera, XVI, 103, *Herminia*.
 1872. Grote, Trans. Am. Entomological Soc., IV, 96, *Herminia*.
 1873. Grote, Trans. Am. Entomological Soc., IV, 309, *Chytolita*.
 1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 39, *Chytolita*.
 1880. Coquillett, Canadian Entomologist, XII, 44, larva.
 1893. Smith, Bull. U. S. Nat. Mus., 41, 381, *Herminia*.

Ground color luteous gray with more intense yellow powderings. Head and thorax concolorous. Primaries with the median lines single, usually distinct, broad, sometimes a little diffuse. Transverse anterior line outwardly bent on the costa, thence nearly upright or only a little irregular or somewhat outcurved in the interspaces. Transverse posterior line widely and very evenly outcurved over the cell, much less incurved below; even or a little marked on the veins. Subterminal line a series of blackish dots or small spots, followed by indefinite paler marks. A slender, interrupted black terminal line. Orbicular wanting. Reniform always evident, usually distinct, sometimes prominent; nearly upright, moderate in size, subkidney shaped, yellowish to blackish, sometimes annulate with black scales. The transverse posterior line is sometimes inwardly diffuse, and sometimes the outer portion of the median space is markedly darker. Secondaries paler, more powdery, with a vague, incomplete, dusky extra median line and a pale, often irregular, also incomplete, subterminal line, which is preceded by a blackish shading. Beneath, with coarse ocherous powderings, a broad, variably distinct median line, a less evident, often obsolete, pale outer line, and on secondaries a dusky discal lunule.

Expanse of wings, 28 to 37 mm. = 1.15 to 1.50 inches.

HABITAT.—Nova Scotia, southward to Virginia: Central States, June and July.

This species varies little except in the distinctness of the reniform and the relative prominence of the median lines. It is common throughout its range and readily started up during the day, while coming freely to light and to sugar. The sexual peculiarities of antennæ and fore legs have been already sufficiently described.

The harpes of the genitalia of the male have a slender, membranous upper prolongation, which is squared at the tip, and a stout, very strongly chitinized, pointed process, inferiorly shorter than the upper part, the intervening space roundedly excavated.

Chytolita petrealis, Grote.

1880. Grote, Canadian Entomologist, XII, 219, *Chytolita*.
 1893. Smith, Bull. U. S. Nat. Mus., 41, 381, *Herminia*.

Ground color luteous gray, more or less black powdered. Head and thorax concolorous. Primaries varying in tint, sometimes almost smoky; median lines usually defined and always traceable, though sometimes obscured. The ordinary lines and marks are in all essentials like those of *C. morbidalis*, save that they are less even, the

transverse anterior more outcurved, the transverse posterior frequently denticulate. The reniform tends to become entirely black; but this is a variable feature. In all other particulars the description of *C. morbidalis* applies.

Expanse of wings, 23 to 31 mm. = 0.92 to 1.24 inches.

HABITAT.—Canada to British Columbia, south to Delaware, west to South Dakota. June and July.

The relation of this species to *C. morbidalis* has been already stated. As a whole, it is distinctly smaller and darker in ground color. There is also a smoky suffusion of the primaries in many cases, and a less marked definition of the ordinary lines. Yet some specimens are exactly like *C. morbidalis* in all save size. With a series of more than fifty specimens at hand, I find none that I consider as doubtful, even where equals in size, though I confess myself unable to define the specific characters more accurately than I have done.

The genitalia of the male agree in all essentials with those of *C. morbidalis*, but the membranous prolongation of harpes is rounded at the tip, the inferior corneous process has a curved point and is more irregular.

Where the two occur together the species is not so common as *C. morbidalis*, but it is less frequent southward, and I have received it from South Dakota without any examples of *C. morbidalis*.

Genus BLEPTINA, Guenée.

1854. Guenée, Species General, Deltoides, 66.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 119.

Head rather prominent, though not large, with a pointed tuft between the antennæ. Eyes prominent, globose, naked. Ocelli small, situated close to the compound eye, rather well removed from the base of the antennæ. Tongue long and strong. Antennæ rather long, in the female simple, with small lateral ciliations; in the male they are either furnished with longer lateral bristles, with or without other ciliations, or are roughly scaled only, without special modification at basal third in either case. Palpi long, rather closely scaled, up and back curved, sickle-shaped, the third joint pointed and not much shorter than the second. Body moderate, more robust in the female; abdomen quite slender and considerably exceeding anal angle of secondaries in the male; more robust, scarcely exceeding the secondaries in the female. The legs are long and stout with the usual spurs of the middle and posterior pair. The anterior legs of the male are modified. The coxa is quite stout with rather a sparse clothing of specialized hair toward the tip. Trochanter normal, not elongated. Femur unusually long, untufted. Tibia very short, but with a very long process, which covers a pencil of yellow or blackish hair. The first tarsal joint is long and stout, equaling in length the tibial process, and the other joints are normal in length. Wings proportionate; venation normal. Primaries elongate, very narrow at base, in the male set well back on the thorax; the costa some-

what concave, the apex pointed, prominent, and the outer margin obliquely rounded; in the female the wings are broader, the costa not depressed, sometimes even a little arched.

This genus is fairly well marked by the characters given. The simply ciliate antennal structure without even a tuft of hair at basal third is quite unusual, and this, with the very distinctive wing form, makes it readily recognizable. Its nearest ally is *Tetanolita*, in which the male antennae and the wing form only are different.

Three species are referred to the genus; two of them, *B. caradrinalis* and *B. medialis*, decidedly variable forms; the other, *B. inferior*, fairly constant within my experience.

They differ structurally, yet may be easily confused, small forms of *B. caradrinalis* frequently doing duty for *B. inferior*. In *B. caradrinalis* the markings are always fairly obvious and usually, distinct; the reniform is often dusky or blackish, the median shade is obvious, and the size is larger than any *B. inferior* I have ever seen. The male antennae are furnished with lateral bristles. *B. inferior* is smaller, as its name imports, more evenly gray in color, somewhat wider winged, with the markings scarcely traceable, and the reniform not black marked in any specimen seen by me. The male antennae lack the lateral bristles on the joints, the ciliations scarcely as prominent even as in the female: but there is a rather evident serration and a somewhat marked covering of coarse scales.

B. medialis resembles *B. caradrinalis* in maculation yet more closely in some cases, but is of the size of *inferior*. The male antennae differ obviously, the longer lateral bristles being reenforced by distinct and numerous ciliations which at once distinguish the species. In maculation the ordinary spots are usually present and distinguished by a broad, diffuse margin, the center, even in the orbicular, pale. This latter character is distinctive when it is visible. Sometimes this spot is wanting, however, and then it becomes difficult to distinguish the forms except by the size and general habitus.

ANALYSIS OF THE SPECIES OF BLEPTINA.

Markings usually obvious; the ordinary spots distinct.

Size larger, average 28 mm.; antennae of male with moderate lateral bristles,
CARADRINALIS.

Size smaller, average 23 mm.; antennae of male with longer and stouter lateral
bristles, reenforced by numerous ciliationsMEDIALIS.

Markings obsolete, ordinary spots small or feebly marked; antennae of male ciliated
merely; size small, average 23 mm.INFERIOR.

Bleptina caradrinalis, Guenée.

1854. Guenée, *Species General*, Deltoïdes, 67, *Bleptina*.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 120, *Bleptina*.

1872. Grote, *Trans. Am. Entomological Soc.*, IV, 93, *Bleptina*.

1878. Grote, *Bull. U. S. Geol. Surv.*, III, 799, *Bleptina*.
cloniasalis, Walker.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 105, *Herminia*.

1877. Grote, *Canadian Entomologist*, IX, 29, *pr. syn.*

Ground color a bluish gray, varying toward clay yellow, and with more or less abundant black powderings. Head and thorax concolorous. Primaries varying in shade, in the relative amount of powderings and in the distinctness of the maculation. Basal line marked on the costa. Transverse anterior line single, blackish, more or less outcurved, irregular, angulated or outcurved in the interspaces, rarely complete, and often merely traceable. Transverse posterior line single, crenulated, as a whole quite evenly bisinuate, though varying in the direction of a single outcurve over the cell, without a corresponding incurve on the submedian interspace. The line varies also in distinctiveness, and is sometimes reduced to a series of venular dots. Subterminal line always distinct, often prominent, yellowish, even, a little outwardly bent below the middle, preceded by a more or less distinct, often prominent, blackish or brown shading and followed by a similar but less prominent, often obsolete, dusky shading which sometimes darkens the entire terminal space.

A series of venular black terminal dots. A rigid or somewhat sinuate, broad, dark or blackish median shade band obliquely crosses the outer part of the median space, involving the reniform. Orbicular punctiform, small, varying from yellow to black. Reniform varying from a narrow yellow lunule to a prominent black kidney-shaped spot of moderate size. When the mark is yellow it incloses a small black dot inferiorly. Secondaries paler, often a dirty whitish gray or yellow, with a vague dusky lunule, a fairly marked dusky median line, a pale subterminal line often marked by darker preceding or following shades, and a series of more or less evident dark or blackish terminal spots. Beneath, varying from luteous to smoky, more or less powdery, with a dark discal lunule, a dusky median line, and a pale subterminal line. All these features are variable; in the pale specimens the median line is best marked and the subterminal pale line is often obscure; while in dark specimens the pale, often yellow, subterminal line is prominent, and the median line is wanting on one or both wings.

Expanse of wings. 25 to 30 mm. = 1 to 1.20 inches.

HABITAT.—Canada to British Columbia, to Texas, to Arizona, New Mexico, Colorado. Texas, in April, May, June; New York, June and July; Delaware, Kansas, and Colorado, in June.

The species is as common as it is widely distributed and as variable as it is common. The difference in wing form between the sexes has been alluded to, and in addition the females are usually more evenly colored, with the ordinary maculation less evident than in the male. The yellow subterminal line is the most prominent feature in most instances and it is often sharply defined by distinct preceding and following dark shadings. The median lines are rarely prominent, and not often completely defined. The transverse anterior varies in the direction of obsolescence and in the amount of irregularity. The transverse posterior varies from crenulate to a series of venular dots.

A distinctive and usually quite marked feature is the broad median shade, and frequently the reniform will be black and form the most conspicuous feature in the wing appearance.

The distinctive structures of the male antennæ and fore legs have been already described so far as essential.

Bleptina medialis, new species.

Ground color bluish gray over luteous brown, more or less black powdered. Head and thorax concolorous, immaculate. Primaries varying in tint. Basal line traceable in all specimens before me, very distinct and black in some cases. Transverse anterior line nearly upright, irregularly outcurved in the interspaces, variably evident but traceable in all specimens before me. Transverse posterior line slender, indistinct, sometimes obsolete, irregular, but hardly crenulated; in course as a whole outcurved over the cell and a little incurved inferiorly. Subterminal line pale, yellowish, even, a little outcurved centrally, defined by dark marginal lines on both sides or set in a dark terminal shade which extends from the middle of the subterminal space to the outer margin. A series of black terminal dots, which are sometimes wanting. Median shade line narrow, brownish, nearly parallel with the transverse posterior line, not diffuse nor prominent, and sometimes wanting. Ordinary spots marked in most of the specimens. Orbicular round, pale-dotted centrally, the defining ring brown or blackish and quite broad. Reniform marked in all the specimens, upright, consisting of concolorous or yellowish central line with a broad black or brownish defining ring. Secondaries smoky to blackish, immaculate in dark forms, in paler examples with an extra median dusky and a pale subterminal line. Beneath, dull smoky, powdery, with common extra median dusky and subterminal pale lines. These are always feebly marked and more or less obsolete on the primaries.

Expanse of wings, 21 to 24 mm. = 0.85 to 0.95 inch.

HABITAT.—Semitropical Florida.

Four specimens are before me, equally divided as to sex. One male was collected by Mr. E. A. Schwarz, at Cocoanut Grove, and is from the collection of the United States National Museum; the others were collected by Mr. Palm in the same region, but the exact locality I do not have.

The species is a well-marked one in the antennal structure of the male, and three of the four specimens are distinct by the dusky immaculate secondaries, by the contrasting blackish outer portion of primaries, and by the pale centered orbicular. The fourth specimen, a female, resembles some forms of *B. caradrinalis* so closely as to make doubt possible. It is smaller, however, and the vestiture is closer, more smooth, the median shade not at all traceable, and the transverse posterior line is not crenulated. The species will probably be found to extend into the West Indies.

Bleptina inferior, Grote

1872. Grote, Trans. Am. Entomological Soc., IV, 91, *Bleptina*.

Darker and of a different hue compared with *B. caradrinalis*. The reniform is creamy pale, as is the orbicular, subobsoletely black ringed, and shows an inferior black included dot. The markings of its congener are reproduced by this smaller species, but less distinctly. The color of the primaries is of a more bluish and darker gray, and they are more uniformly colored, hardly darker shaded terminally. The secondaries are much darker, almost wholly blackish; the lines imperceptible or obsolete. Beneath, both wings blackish, the subterminal line alone barely perceivable.

Expanse of wings, 20 to 25 mm. = 0.80 to 1 inch.

HABITAT.—Southern States to Texas; May, August, and October.

I have already referred to the fact that this species has been mistaken in collections, and I am afraid I am responsible for some of the errors. This has led me to give what I now believe to be too great a geographic range to this species in my catalogue, and I am inclined to doubt whether it occurs in the Middle States at all. The comparative description above given is Mr. Grote's original characterization, and points out the essential features of the ornamentation. The same characters separate it also from *B. medialis*. Within my experience the species varies little. To the quite unusual antennal structure of the male I have already referred. The fore legs are in all essentials like those of *B. caradrinalis*, but less developed, and proportionately shorter.

Genus TETANOLITA, Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 305.

Head moderate or rather small, front with an inter-antennal pointed tuft. Eyes prominent, globose. Ocelli distinct, situated well back, close to the compound eye, and well removed from the base of the antennae. Tongue moderate. Palpi long, curved upward, and a little flattened, quite closely scaled, third joint long and pointed. Antennae moderate in length, in the female simple, in the male with lateral bristles, varying in the species, and at basal third with a tuft of hair which is variably developed and covers two very slightly dilated joints. Body slight, abdomen slender, cylindrical, reaching to or somewhat exceeding the anal angle of secondaries; in the female, pointed at tip and somewhat conic. Legs long and rather slender, closely scaled, the usual spurs of the middle and hind tibiae long and unequal. In the male the fore legs are quite strongly modified. The coxa is long, quite stout, with a peculiar excavation or emargination at the outer side at base. The trochanter is about one-third the length of the femur and combined with the latter a trifle longer than the coxa. The femur is furnished with a rather short pencil of hair attached at base, capable of fanlike expansion, and a fringing of specialized scales laterally near

tip. The tibia is reduced to a huge process which covers a mass of specialized scales, and a pencil of dark hair. The tarsi are long, very weak, slender, and hardly functional. The wings vary somewhat in width, being comparatively elongate, narrow and obtuse in *T. mynesalis*, more trigonate, wider, and with a marked apex in *T. floridana*, and with an altogether broader, more ample, and frail appearance in *T. palligera*. In the latter species the outer margin is somewhat marked at the middle when the fringes are defective. In all the species the accessory cell is wanting and veins 7 to 10 are stalked, vein 10 arising very close to the base of the stalk. It is altogether likely, though, none of my specimens show it, that the accessory cell may be sometimes present.

The three species referred to this genus are closely allied and yet very distinct. All the essential structural details are similar, and yet in minor points they differ markedly. The difference in wing form between *T. mynesalis* and *T. palligera* is at first sight very great, but specimens of *T. floridana* are completely intermediate. In the structure of the male fore legs the species agree remarkably. In the structure of the male antennae the agreement is only in the type. In *T. mynesalis* the joints are rather even, cylindrical, not marked, furnished with moderate, slender, lateral bristles, and with little tufts of fine hair inferiorly arising from small tubercles. The tuft is quite long and marked.

In *T. floridana* the joints are much more robust and shorter, marked, almost subserrate, with coarse scaly clothing. The lateral bristles are hardly more prominent, but the tuftings inferiorly consist of decidedly longer hair.

In *T. palligera* the joints are yet more marked above the tuft which in this species is much reduced; the scaly vestiture forms two elevated rings on each joint and the lateral bristles are much reduced in length and thickness.

In color *T. mynesalis* is usually smoky to blackish over a somewhat luteous base, which occasionally appears quite distinctly.

T. floridana is luteous, with smoky powderings which darken the terminal portion of both wings.

T. palligera is paler, with brown powderings arranged much as in the preceding species, but frequently with a more yellow suffusion.

In maculation the three species agree most remarkably, so a description of one will practically answer for all.

ANALYSIS OF THE SPECIES OF TETANOLITA.

- Color smoky to blackish; male antenna with joints not marked, lateral bristles moderate.....MYNESALIS.
 Color luteous; male antenna with joints subserrate, lateral bristles well marked,.....FLORIDANA.
 Color luteous; male antenna with joints serrate above the much-reduced tuft, the lateral bristles small.....PALLIGERA.

Tetanolita mynesalis, Walker.1859. Walker, Cat. Brit. Mus., Heterocera, XIX, 860, *Bleptina*.1893. Smith, Bull. U. S. Nat. Mus., 44, 389, *Tetanolita*
lialis, Grote.1873. Grote, Trans. Am. Entomological Soc., IV, 306, *Tetanolita*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 389, pr. syn.

Silky blackish. Primaries with a faint purplish reflection. Transverse anterior line indistinct, linear, darker than the ground color of the wing, medially with a rounded outward inclination. Reniform clear pale-yellowish in both my specimens, without included dots, indistinctly darker ringed, contrasting. Transverse posterior line linear, dark, finely dentate, indicated on costa by pale scales; a little projected opposite the cell. Subterminal line distinctly indicated by small whitish humulated included dots, a little outwardly projected over median nervules. A very fine terminal line; fringes concolorous, neatly interrupted with pale scales. The neat ornamentation may be clearly seen against the almost uniform blackish ground of the primaries, with attention. Hind wings much paler, smoky-whitish, with two darker median lines approximating toward internal margin, and a faint discal mark; terminal line and fringes as on primaries. Beneath blackish, paling toward internal margins, with distinct discal marks and double, neatly and minutely dentated transverse lines. Head and appendages, thorax and legs outwardly blackish, concolorous; abdomen paler. Tarsi dotted with pale scales.

Expanse of wings, 20 to 23 mm.=0.80 to 0.90 inch.

HABITAT.—Middle, Central, and Southern States; Texas in March, May, and October; Illinois in July.

The species is not common, except in the southern portion of its range, being most often received from Texas. It varies little, except in the distinctness of the maculation, the form described by Mr. Grote being a well-marked type which is somewhat less common. Usually the yellow reniform is quite obvious, but sometimes even this disappears. A point not mentioned by Mr. Grote is the fact that the blackish abdomen is usually narrowly pale annulate.

Tetanolita floridana, new species.

Ground color a pale luteous, with variably distinct smoky powderings. Head concolorous with the darker, the thorax with the paler parts of the wing; abdomen somewhat more gray, the edges of the segments paler ringed. Primaries with the markings ill defined, more or less darkened over the costal region, the outer part of subterminal and all the terminal space dusky. Basal line faintly indicated in some specimens. Transverse anterior line single, blackish, a large outcurve in the submedian interspace, else nearly upright. Transverse posterior line slender, dusky, crenulated, oblique, nearly parallel with the outer margin. Subterminal line pale, more or less interrupted, parallel with

the outer margin or a little sinuated, emphasized by the smoky shade through which it runs. A series of black terminal lunules, fringes pale, cut with smoky brown. There is a diffuse, oblique, broad, smoky, median shade, which is variably evident and usually involves the reniform. Orbicular a small yellow dot, which is never prominent and often obsolete. Reniform a small yellowish line or lunule, sometimes almost obscured by the dusky median shade. Secondaries gray or whitish at base, darkening to smoky or blackish outwardly; with an extra median, rather even, darker line, and a pale, irregularly denticulate, subterminal line, through the darker outer region. A series of black terminal lunules. Beneath gray, black powdered, darkening outwardly; with a more or less complete dusky extra median line and a more evident, pale, subterminal line, repeating the upper side on both wings. A more or less marked discal lunule, sometimes obsolete on the primaries.

Expanse of wings, 20 to 21 mm.=0.80 to 0.85 inch.

HABITAT.—Florida, Archer, in March and April; Texas, in March.

Both sexes are at hand, and are similar in appearance. It has been impossible for me to find a single permanent difference in marking between this species and the two others. It is paler than *T. livalis* and darker than *T. palligera*, wider winged than the former, narrower than the latter. The structural differences have been already noted, and with both sexes at hand no trouble need be found in recognizing the species. It is probably not rare in its range, which, thus far, is confined to Florida and Texas. It will probably be found in the other Gulf States. This is the species, a specimen of which I rather doubtfully referred to *T. palligera* when describing the latter species, and whose distinctness is again suggested in Bulletin 44, United States National Museum, 385.

The types are in the collection of the United States National Museum.

***Tetanolita palligera* Smith.**

1881. Smith, Bull. Bkln. Entomological Soc., VII. 6, *Heterogramma*.

Ground color a dirty powdery luteous, with a more yellowish suffusion in some specimens. Head and thorax concolorous, the abdomen somewhat paler, and with rather feebly marked paler wings. Primaries with the markings all obscured, the subterminal line which runs through a darker terminal space the only distinct feature of the wing. The markings are like those described for the previous species, and the present differs mainly in its larger size, paler ground, and more obscure maculation.

Expanse of wings, 21 to 25 mm. = 0.85 to 1 inch.

HABITAT.—California: Napa County; Panamint Valley in April; Knightly Valley.

Five specimens are before me, all of them from the National Museum collection. Others are in the Edwards collection in the American

Museum of Natural History. The specimen from Panamint Valley comes nearest to the Floridian species in appearance; but the more ample wings will suffice to distinguish the form, even from the most similar of the other. The structural characters previously described are, of course, decisive whenever a male is at hand. In somewhat rubbed specimens, in which the fringes are defective, the outer margin of the primaries seems slightly angulated at the middle, and this must be my excuse for referring the species to *Heterogramma* in the first description from somewhat scant material. It is probable that in its range the species will be found not uncommon.

Genus RENIA, Guenée.

1854. Guenée, *Species General*, *Deltoides*, 80.

1859. Walker, *Cat. Brit. Mus. Heterocera*, XVI, 147.

1877. Grote, *Bull. U. S. Geol. Surv.*, III, 119.

Head moderate, sometimes quite prominent. Eyes large, naked, globose. Ocelli distinct, set well back from the base of the antennae and close to the compound eye. Front with a pointed interantennal tuft. Tongue moderate. Palpi somewhat variable, laterally compressed, directed straight forward, obliquely ascending or even recurved, sickle-shaped; the second joint longest, clothed on the upper side with upright scales, sometimes evenly, sometimes massed toward the middle, making it seem higher. The terminal joint varies considerably in length, always set into the second at a small angle, and this also quite usually clothed with upright scales, which are longest at the middle, giving the joint a triangular appearance when viewed from the side. Antennae long or moderate; in the female simple, with fine lateral cilia-tions; in the male with distinct, though not very long, lateral bristles. Beyond the middle, in this sex, is a prominent pointed tuft of hair on the outer side, which conceals an elongated curved joint, which in turn protects a tuft or pencil of specialized hair. Beyond this point the joints of the antennae become shorter, somewhat serrate, the lateral bristles shorter, and there is a very distinct tendency to a curling or coiling of the tip. Body moderate, abdomen slender, cylindrical, somewhat exceeding the anal angle of the secondaries. The legs are long and moderately stout, the tibia with the normal spurs. In the male the fore legs are modified, the modification confined to the tibia and tarsi. The tibia is very short, anteriorly produced into a long process which covers the first tarsal joint, concealing specialized scales, but no tufts or pencils of hair. The wings are large; the primaries trigonate, pointed at the apex, the outer margin oblique or arquate, considerable variation existing in this feature. The venation is somewhat abnormal, lacking the accessory cell in all the species and in all the specimens examined, though I would not be surprised, from what I have seen, to find exceptional specimens with a more or less perfectly developed accessory cell. In most instances veins 7 to 10 are from one stalk; but occasionally 7 is free.

This genus is an extremely interesting one. There are a number of species, and while they belong together, without doubt, there is a considerable amount of variation. In all, however, the peculiarity of the male antenna is marked, and in general the wing form is similar. In the palpi there is a great range of variation, and while the type found in *Herminia* is controlling, yet in *R. centralis* the upright scales are not prominent, and we get a form dangerously like *Tetanolita*, which this species also resembles in color, in markings, and to some extent in wing form. In *R. salusalis* (*brevisrostralis*) a sexual peculiarity is found in the male in the form of a truncated tuft or brush of hairlike scales on the upper and inner side. The structure of the male fore leg is practically alike in all the species. Coxa, trochanter, and femur are normal, or nearly so; the tibia is short, but produced into a long process anteriorly, without covering any tufts or pencils of hair, and therefore correspondingly narrow.

All the described species are known to me, and I have found two others not yet characterized among the material before me. *R. salusalis*, better known as *R. brevisrostralis*, differs at once from all the other species by the short palpi of the male, which also have a truncated tuft of hair on the upper side of the middle joint, and have the terminal joint short, the entire member oblique. The primaries are distinctly pointed at the apex, and the outer margin is oblique and long. In color the male is pale luteous, and the ordinary lines are punctiform or crenulated.

The remainder of the species have the palpi longer in both sexes, without special modification in the male, and they separate into two distinct series on the character of the transverse posterior line, as pointed out by Mr. Grote. In the majority of the species it is irregular, dentate, crenulate, punctiform, or otherwise marked; but in two species, *R. flavipunctalis* and *R. pulchrosalis*, it is even, pale, and preceded by a more or less marked, also even, dusky line.

Of the first series, *R. discoloralis* is much the largest, exceeding in size indeed all others of the genus, and is thus recognizable by that character alone. It is also much the most variable, rivaling *Zanclognatha leucigata* in its protean changes, and we find every gradation from a uniform tint, in which none of the markings are traceable, to a strongly contrasting type, in which all the lines are prominent and all the spaces discolorous. A prominent feature is found in the nearly continuous subterminal line, marked by both a preceding and a following darker shading in most instances.

The other species of this section are decidedly smaller, never variable, and again divided on wing form. *R. fraternalis*, *R. sobriusalis*, and *R. larvalis* have longer, more pointed fore wings, the apex marked, the outer margin quite oblique and with a little tendency to incurve below the tip of the wing. *R. clitosalis* and *R. factiosalis* have the fore wings

shorter, less trigonate, broader toward base, the outer margin much less oblique, and the apices scarcely rectangular and not in the least pointed.

R. fraterialis varies from pale luteous in the male to light-red brown in the female. The appearance of the male is very suggestive of a small *R. salusalis* (*brerirostralis*); but the palpi show the difference at a glance, being straight and long without sexual modification. The female differs markedly from the male in color, this sexual difference recurring in this genus only in *R. salusalis*, and the maculation, which in the male is quite distinct, is almost lost in the female, in which the subterminal line alone remains marked.

R. sobrialis (*restrictalis*) is smoky over luteous, varying to blackish, with the maculation obscure, and *R. larralis* resembles it except in size, being somewhat larger and in having a somewhat paler, more purplish tinge to the primaries. According to Mr. Grote, "It will be easy to distinguish *R. restrictalis* from *R. larralis*, with which it agrees in ornamentation and general tint, if we observe the greatly shorter and recurved labial palpi of the female. In *R. larralis* the female labial palpi are extended forward and are as long as in *R. brerirostralis*. The antennus is shorter from the base to the tuft in *R. restrictalis* than in *R. larralis*; the form is narrower, the general color darker, more glossy." Both the antennal and palpal characters pointed out are unreliable, and while they hold in perhaps a considerable proportion of cases, yet I have seen instances in which they were exactly reversed, and the examination of the large series of specimens of all species now before me shows that there is a sufficiently great range of variation, especially in the palpi, to render their use for specific characters at least unsafe.

R. clitosalis (*centralis*) is another smoky, rather more blackish species, but the wing form already mentioned separates it from those immediately preceding. The palpi are more evenly clothed than usual in the genus and are more or less sickle shaped in both sexes. The species strongly resembles *Tetanolita mynesalis* on a much larger scale, and is quite different from any other of its congeners.

R. factiosalis (*plenilinealis*) agrees with *R. clitosalis* in wing form, but differs in all other characters. It is leather brown in color, varying to a deeper shade, with more or less black powdering. The maculation is variably distinct, and sometimes the spaces contrast more or less, varying to an almost uniform leather brown with the maculation obscured, as in the form named *R. alutalis* by Mr. Grote.

The remaining species are those already separated off on the even, pale, transverse posterior line of the primaries, and they are closely related.

R. flavipunctalis is a well marked species, and the maculation is in most cases distinct, the transverse posterior line prominent and continued somewhat more faintly across the secondaries.

R. pulverosalis is obscurely marked, altogether more frail, with longer palpi, more slender antennae, and more pointed primaries. The wings are entirely obscured by smoky powderings, and the markings of the primaries are traced with difficulty, while on the secondaries they are often scarcely obvious.

ANALYSIS OF THE SPECIES OF RENIA.

1. Palpi of male short, oblique; middle joint with a specialized tuft or brush of hair; terminal joint short *SALUSALIS*.
Palpi long in both sexes; without specialized tuft of hair; terminal joint at least moderate 2.
2. Transverse posterior line more or less denticulate, narrow, blackish, not accompanied by a pale shade, often obsolete or barely traceable..... 3
Transverse posterior line pale, even, preceded by a narrow, even, dusky line .. 8.
3. Primaries trigonate, with the apex somewhat produced acute; outer margin long, a little excavated below, and very oblique..... 4.
Primaries shorter and broader; apex rectangular; outer margin not excavated, shorter, and only a little oblique 7.
4. Size large; subterminal line distinct, outwardly angulated at its middle, preceded or followed, or both, by a dusky defining shade *DISCOLORALIS*.
Size moderate or small; subterminal line punctiform, preceded by variably distinct spots rather than shades 5.
5. Color luteous to leather brown *FRATERNALIS*.
Color smoky or gray over luteous 6.
6. Size smaller; expanse, 23-26 mm *SOBRALIS*.
Size larger; expanse, 28-30 mm *LARVALIS*.
7. Color smoky or blackish *CLITOSALIS*.
Color leather brown to luteous..... *FACTIOSALIS*.
8. Markings fairly distinct; secondaries crossed by a pale line..... *FLAVIPUNCTALIS*.
Markings obscure, powdery; secondaries almost immaculate..... *PULVEROSALIS*.

Renia salusalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 107, *Herminia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 387, *Renia*.
brevisrostralis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 25, *Renia*.

1873. Grote, Trans. Am. Entomological Soc., IV, 309, pl. 1, ff. 91, 92, *Renia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 387, pr. syn.

Ground color luteous, varying in shade, with black powderings. Head and thorax concolorous. Primaries with the markings distinct in the male, a little obscure in the female. Basal line punctiform, traceable in the specimens before me. Transverse anterior line brown, upright, or nearly so, a little irregular. Transverse posterior line crenulated, rather evenly bisinuate as a whole, and very oblique, nearly parallel with the outer margin. The line is sometimes reduced to a series of venular dots. Subterminal line irregular, pale, obscure, marked by blackish preceding spots varying in number and distinctness, and sometimes followed by less evident marks of the same character. A series of black venular dots. A diffuse, oblique, brown median shade becomes evident below the reniform and often con-

spicuous at the inner margin. Orbicular marked as a small, clear yellow spot, which is sometimes lost. Reniform upright, narrow, somewhat constricted centrally, yellow, with a black dot at each extremity. Secondaries paler, but rather more smoky, with a distinct dusky extra median line continuous with the transverse posterior of primaries, and a pale subterminal line continuous with that of the primaries, and sometimes marked by darker shadings, and, indeed, as a rule the wings darken outwardly, relieving the line somewhat. A series of black terminal dots, sometimes forming an interrupted terminal line. Beneath with ocherous powderings; all wings with a discal mark, a brown extra median, a pale subterminal and a blackish terminal line, the latter interrupted and somewhat punctiform.

Expanse of wings, 20 to 32 mm. = 0.80 to 1.25 inches.

HABITAT.—Eastern, Middle, and Central States; Georgia, Alabama, Colorado.

The essential characters of the species have been pointed out in the introductory remarks. The male seems to have the power of expanding in every direction the palpal tuft. The palpi of the female are normal and quite long. In this sex the tendency is to a more reddish ground color and less evident maculation. In a small male from Georgia the reniform is prominently black and the other markings are reduced and punctiform.

The other sexual characters of antennæ and fore legs agree with those of the genus.

***Renia discoloralis*, Guenée.**

1854. Guenée, Species General, Deltoides, 82, *Renia*.

1872. Grote, Trans. Am. Entomological Soc., IV, 24, *Renia*.
fallacialis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 38, *Hypena*.

1872. Grote, Trans. Am. Entomological Soc., IV, 25, pr. syn.

1893. Smith, Bull. U. S. Nat. Mus., 44, 387.

generalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 29, *Hypena*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 386, pr. syn.

thraxalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 109, *Herminia*.

1891. Smith, List Lepidoptera, 63, pr. syn.

Ground color varying from pale luteous to dark brown, always powdery. Head and thorax always of the prevailing color. Primaries with the subterminal line distinct in most instances, but else varying in every possible direction. Basal line evident, broad, brown. Transverse anterior line outcurved in the interspaces and as a whole a little outcurved. Transverse posterior line irregularly dentate and crenate and irregularly sinuate and inwardly oblique in its general course. Subterminal line pale, a little irregular, always with a marked outward angle at about the middle, preceded or followed, or both, by a darker shade, often more prominent before the angulation. A series of venu-

lar terminal dots. There is a broad, oblique, somewhat diffuse median shade. Orbicular small, round, yellow. Reniform upright, narrow, yellow, with black dots at each extremity, sometimes connected by a dark line. Secondaries varying from pale yellowish gray to almost black, with a vague dusky median and pale subterminal line and a series of blackish terminal lunules. Beneath more coarsely powdery; all wings with a discal lunule, a broad, common, brown median line, a pale subterminal line, and a series of dark terminal lunules.

Expanse of wings, 33 to 40 mm. = 1.32 to 1.60 inches.

HABITAT.—Canada to Virginia; Central States; New York and Delaware in July; District of Columbia in August.

The above description applies to an evenly colored specimen in which all the maculation is well defined; but as a matter of fact such specimens are the exception rather than the rule. Very pale and very dark specimens tend to an obsolescence of all maculation, and only intermediate forms are apt to have it evenly defined. Besides this range of variation in evenly colored forms, there is a decided tendency, equally marked in both sexes in my experience, toward discoloration. The median space may be dark and all else contrasting pale, or the opposite may be the case, or only one space may be affected, and this is as likely to be the basal as the terminal. Yet, withal, the character of the species changes little, and its size alone will serve for its recognition. In the male the palpi are curved; the vestiture of the middle joint is therefore longer at the middle than at the base, while in the female the palpi are straight and the scales are even.

The species is quite widely distributed and is not rare. The sexual modifications offer nothing out of the common.

Renia fraternalis, new species.

Ground color in the male a pale luteous gray; in the female yellowish red-brown. Head and thorax concolorous with primaries. Primaries in the male with the maculation fairly well marked; in the female the subterminal line only is defined in most instances. Basal line indicated on the costa. Transverse anterior line single, blackish, irregularly outcurved, and outwardly exerted in the interspaces. Transverse posterior line finely crenulated, often punctiform, black, nearly parallel with the outer margin, or only a little sinuated. Subterminal line punctiform, a little outwardly bent about the middle, consisting of whitish dots set in a more or less marked lead-colored or black shading. A series of black terminal dots or marks. A rather narrow, undefined, median shade line, visible only below the median vein. Orbicular a small yellow dot. Reniform narrow, upright, yellow, with a black dot at each extremity. Secondaries somewhat paler than primaries, with a dusky median line and a pale subterminal line, which is sometimes absorbed in a darker shading which precedes it. Beneath more powdery; both wings with discal spots, a usually distinct dusky median line, and an (often wanting) pale subterminal line.

Expanse of wings, 23 to 27 mm. = 0.90 to 1.08 inches.

HABITAT.—Florida, Archer in February, Rock Ledge in April; Savannah, Ga.

Twelve specimens are before me, showing little variation, but a constant sexual difference in color. The males have, in all cases before me, the described markings, though not equally evident, while in all the females the subterminal line is the only distinct feature, though the reniform is usually very well marked.

In the male the palpi are a little shorter than they are in the female, and are somewhat oblique, and in this sex the wings are also a little narrower.

It is quite certain that this species has been confused in collections, the males with *R. salusalis* and the females either with that species or with *R. sobrialis*, which they resemble in wing form.

In size the species is much below the average of *R. salusalis*, and equals *R. sobrialis*, though I have seen some extremely small specimens of *R. salusalis* (20 mm.).

The species seems not uncommon in its range.

Renia sobrialis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 228, *Hypena*.

1893. Smith, Bull. U. S. Nat. Mus., 41, 387, *Renia*.

restrictalis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 26 and 308, pl. I, fig. 94, *Renia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 387, pr. syn.

Ground color smoky brown to blackish, powdery. Head and thorax concolorous. Primaries with the maculation obscure. Transverse anterior line irregularly outcurved. Transverse posterior line barely traceable, punctiform, as a whole nearly parallel with the outer margin. Subterminal line pale, slightly irregular, usually interrupted, sometimes punctiform, occasionally almost obsolete, marked by a preceding dusky shade, which becomes broken into spots when the line is punctiform, sometimes appearing as a series of dark, white centered blotches. Median line traceable below the median vein in some specimens. A series of black terminal dots or marks. Orbicular a small yellow dot which is sometimes wanting. Reniform upright, narrow, yellow, with more or less obvious black points at the extremities. Secondaries scarcely paler than primaries, with a dusky extra-median and a pale subterminal line; both barely traceable. Beneath smoky, coarsely powdered, with a dark extra-median and pale subterminal line, the latter rarely distinct.

Expanse of wings, 23 to 26 mm. = 0.92 to 1.04 inches.

HABITAT.—Nova Scotia to Virginia, Central States; District of Columbia in August; Colorado in September.

Mr. Grote gives the expanse as 27 to 28 mm., which is greater than any I have seen, and greater than his type specimen in the collection of the American Entomological Society. In the specimens before me

there is no variation save in the depth of the ground color, and in a very slight relative difference in the distinctness of the maculation.

There is the usual sexual difference in the palpi, those of the male being oblique while those of the female are straight.

I have associated with this species two specimens from Glenwood Springs, Colo., which may prove different when larger material is at hand. They are much more powdery and seem slighter, yet with practically the same markings as in the eastern specimens.

Renia larvalis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 26, *Renia*.

1873. Grote, Trans. Am. Entomological Soc., IV, 303, *Renia*.

This in all essentials like *R. sobrialis*, save that it is paler, more luteous, and the maculation rather more distinct.

Expanse of wings, 28 to 30 mm.=1.12 to 1.20 inches.

Except the somewhat greater size and somewhat paler color I can not find any differences. Mr. Grote makes the size 32 to 34 mm., which is larger than any I have seen, including the type. I think there must be an error in Mr. Grote's measurements of these species. I have had no difficulty in keeping these two forms apart in collections, but can not find a single feature except size and ground color to separate them. The characters pointed out by Mr. Grote are not constant. The range of the present species seems to be greater, extending to Florida and Texas, but there is really no certainty as to which of the two species the records refer to. Specimens from Delaware and Washington, D. C., in May, and Florida in March are correct, and raise the question whether there may not be a seasonal relation between the specimens taken at Washington in May (*R. larvalis*) and those taken in August (*R. sobrialis*). My material is not sufficient to settle the matter finally, and the species are therefore retained as distinct.

Renia clitosalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 108, *Herminia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 388, *Renia*.

centralis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 27 and 309, *Renia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 388, pr. syn.

Very dark smoky brown or blackish, somewhat glossy. Head and thorax concolorous. Primaries with the markings faintly traceable at best, sometimes almost obsolete, no feature prominent. Transverse anterior line a little irregular, oblique. Transverse posterior line irregularly denticulate, with an even outcurve or a little drawn in on the submedian interspace; followed by a vague paler shade, usually marked as a yellowish dot on the costa, and sometimes confined to this. Subterminal line punctiform, consisting of small white dots which bend outwardly below the middle. Sometimes a more or less undefined

darker shade emphasizes these dots. A series of blackish terminal lunules. Orbicular a small yellow dot, which is often wanting. Reniform upright, narrow, yellow, with a small black dot at each extremity. Secondaries a little paler, with a median darker, an extramedian pale, and an interrupted blackish terminal line. The subterminal line is quite usually lost, sometimes marked by a darker shading, which persists when the line which it was meant to define has disappeared. Beneath paler, the secondaries more grayish and coarsely powdered. All wings with a discal spot, a rather broad, extra median dark shade line, and a slender, whitish, subterminal line, which is sometimes a little diffuse on the secondaries.

Expanse of wings 23 to 25 mm. = 0.92 to 1 inch.

HABITAT.—Nova Scotia to West Virginia; Central States; New York and Washington, D. C., in August.

This is a fairly well marked species, varying in depth of ground color and in the relative indistinctness of the maculation. The body structure is comparatively more robust, and the wing form is less extended apically than in the last preceding species. I can not find in my specimens the sexual difference in the palpi described by Mr. Grote, and think it probable that he had associated poor specimens of different species as two sexes, an association which led to my suggestion¹ that this was a small form of *R. restrictalis*. Good specimens of both sexes make it certain that we have a good species in which the palpi are alike in male and female, and are also more closely scaled than in the other species; approaching *Tetanolita* very decidedly. The species does not seem to be common.

Renia factiosalis, Walker.

1859. Walker, Cat. Brit. Mus. Heterocera, XVI, 37, *Hyppena*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 388, *Renia*.

plenilinealis, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 99, *Renia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 388, pr. syn.

alutalis, Grote.

1872. Grote, Trans. Am. Entomological Soc. IV, 99, *Renia*.

1873. Grote, Trans. Am. Entomological Soc., IV, 309, *Renia*.

Ground color varying from luteous to leather brown, more or less powdery, sometimes appearing smoky. Head and thorax concolorous. Primaries with the maculation variably distinct, sometimes obscured, more usually evident, sometimes contrasting. There is a decided tendency to discoloration, as in *R. discoloralis*, but less strongly marked. As a rule the dusky shade preceding the subterminal line is the most marked character. Basal line evident in the costal space. Transverse anterior line distinct, sometimes prominent, even or slightly sinuate, upright or only a little bent or oblique. Transverse posterior line irregular, even over the costal region, irregularly crenulate, sometimes punctiform below this point; as a whole nearly parallel with the outer margin. Subterminal line only a little paler than the ground color;

¹ Bull. U. S. Nat. Mus., 44, 388.

but usually defined by a distinct dark preceding shade which sometimes becomes diffuse, involving the terminal space in whole or in part, and occasionally reduces the line to a series of pale dotlets, all intermediate forms occurring. A series of blackish terminal lunules, sometimes reduced to mere points. Median shade broad, diffuse, upright, varying from this to entire absence. Orbicular small, rounded, varying from yellow to concolorous, to black. Reniform upright, narrow, paler or concolorous, defined by black scales, immaculate, with black points which may be connected and form a lunule, or the entire spot may be black and contrasting, in such cases somewhat undefined. Secondaries smoky, varying to fuscous or purple, with a dark median line followed by a paler shade, and a pale subterminal line preceded by a dusky shade; in each instance varying to obsolescence. Beneath, varying from gray to smoky or brown, powdery, with a variably marked median dark and subterminal pale line.

Expanse of wings, 23 to 28 mm. = 0.92 to 1.12 inches.

HABITAT.—Canada to Virginia, to Colorado. Canada and Washington, D. C., in August; Colorado, August, September.

Of the specimens before me no two are alike, and I know the range of variation is greater than even my material indicates. In the line of discoloration the tendency seems to be toward a pale basal and subterminal space; but it may be reversed in a larger series. The most conspicuous change occurs in the ordinary spots from yellow to black, and I am not at all surprised that Mr. Grote made two species from limited material. I have not seen his type, but have seen the specimens named *R. alutalis* in his collection, which do not agree closely with his description. From the description, which is quite characteristic, I have named specimens fully agreeing with it, and certainly referable to *R. plenilinealis*, of which I have seen the type.

The sexual difference between the palpi is marked in this species; those of the male being oblique and somewhat shorter, while those of the female are longer and straight.

Renia flavipunctalis, Geyer.

- 1832. Geyer, Zuträge, IV, 25, figs. 701, 702, *Antiblemna*.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XIX, 859, ? *Herminia*.
- 1881. Grote, Canadian Entomologist, XIII, 91, *Renia*.
phalerosalis, Walker.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 107, *Herminia*.
- 1893. Smith, Bull. U. S. Nat. Mus., 44, 388, pr. syn.
heliusalis, Walker.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 108, *Herminia*.
- 1893. Smith, Bull. U. S. Nat. Mus., 44, 388, pr. syn.
pastoralis, Grote.
- 1872. Grote, Trans. Am. Entomological Soc., IV, 27, *Renia*.
- 1873. Grote, Trans. Am. Entomological Soc., IV, 304, = *belfragei*.
belfragei, Grote.
- 1872. Grote, Trans. Am. Entomological Soc., IV, 27, *Renia*.
- 1873. Grote, Trans. Am. Entomological Soc., IV, 304, Pl. I, fig. 95, *Renia*.
- 1883. Grote, Canadian Entomologist, XIII, 91, pr. syn.

Ground color a powdery luteous gray, varying somewhat in shade. Head and thorax of the light ground, without powderings. Primaries with the markings distinct in all the specimens seen, and as a rule with some contrasts in color, the subterminal space being particularly liable to be darker in color than the rest of the wing. Basal line wanting in the specimens examined. Transverse anterior line upright or nearly so, even, brown, usually preceded by a pale shade, quite often outwardly diffuse. Transverse posterior line narrow, brown, followed by a broader yellow or whitish line, both even, usually nearly upright or a little outcurved; but sometimes broadly outcurved over the cell and correspondingly drawn in below. Subterminal line pale, irregular, rarely continuous, sometimes punctiform and often obscured in the lower part of its course, preceded and defined by a dusky shade which is also sometimes broken into spots, but is more usually diffuse, darkening the entire subterminal space. A series of more or less distinct terminal black dots or lunules. A broad, diffuse, upright median shade is present in some specimens and varies to total obsolescence. Orbicular small, round, yellow, often absent, rarely black. Reniform upright, narrow, somewhat constricted, yellow, with black points, a black lunule, or entirely invaded by black. Secondaries paler, dirty gray with an even central pale line preceded by a dusky shade, and an irregular, pale subterminal line which is often obsolete. Beneath, coarsely powdered, with a vague discal lunule on secondaries, and on all wings a brown extra-median line and often an exterior pale line. The latter is, however, quite frequently lost altogether and yet more often lost on the primaries alone.

Expanse of wings, 20 to 30 mm. = 0.80 to 1.20 inches.

HABITAT.—Canada to Alabama, to Texas, New Mexico; New York and New Jersey, July and August; District of Columbia, Indiana and Illinois in July; Texas in May and June.

This is our most common and widely distributed species, and it is at the same time the most easily recognizable. The clear, even transverse posterior line is unique in the genus, and this is continued to the secondaries, giving some specimens a very distinct geometriform appearance. The line of variation has been somewhat indicated in the description, and while it is considerable it is not confusing, because the characteristic median lines dominate everything. The difference in sex is strongly marked in the palpal structure. In the male they are quite decidedly recurved, while in the female they are straight or at most oblique.

Renia pulverosalis, new species.

Ground color varying from dirty luteous to smoky, powdered with black scales. Head and thorax concolorous. Primaries with all the maculation obscure, difficult to make out, with no prominent feature. Transverse anterior line dusky, even, a little outcurved. Transverse

posterior line narrow, dusky, accompanied outwardly by a paler, broader, equally even pale line, the lines varying in general course from an even outcurve to an even, not strongly marked, bisinuation. Subterminal line vague, paler, often punctiform, and frequently in great part lost; preceded by a vague darker shade, which is often broken into blotches. A series of obscure terminal dark marks. There is an obscure, indefinite upright median shade, which is outwardly diffuse and slightly darkens the outer portion of the median space. Orbicular small, round, yellow, often wanting. Reniform narrow, upright, yellowish, with or without black dots at the extremities, sometimes entirely black. Secondaries gray to smoky, immaculate or with faint traces of median and subterminal lines. Beneath somewhat paler, coarsely powdered, with traces of a discal lunule, and the two usual transverse lines.

Expanse of wings, 26 to 32 mm. = 1.05 to 1.30 inches.

HABITAT.—Glenwood Springs, Colo., August and September.

Six specimens, equally divided as to sex, are before me, all from Dr. William Barnes.

The species has on close study all the markings found in *R. flaripunctalis*, so far as the primaries are concerned, and of this species I was at first inclined to consider it an extreme variety. Closer study shows that it is altogether a slighter form, with the outline of *R. sobrialis* rather than *R. flaripunctalis*, and the wings as much drawn out and pointed. The wings are uniformly powdered, and the transverse posterior line is almost obsolete. On the secondaries the median pale line is entirely lost, and in fact the wings are sometimes entirely immaculate. Finally, the palpi are much longer, and in the male are not at all recurved, but rigidly oblique. Its relations are thus in reality with *R. sobrialis* and *R. larvalis* rather than with *R. flaripunctalis*, to which the character of the maculation refers it.

Genus **HYPENULA**, Grote.

1876. Grote, Canadian Entomologist, VIII, 27.

The eyes are naked, large, globose. Front with a pointed, scaly tuft. Tongue strong, moderate in length. Palpi long, flattened, upcurved and curving backward, much exceeding the vertex; second joint much the longest. The scaly clothing is somewhat loose and directed upward and backward; on the terminal joint it is truncated or cut off at tip, making the joint in outline somewhat hatchet-shaped. In the male the palpi are a very little longer than in the female. Antennae situated on the vertex, moderate in length, in the female with single small lateral ciliations. In the male the joints have moderately long curved and slender lateral bristles, and on the underside of the shaft are little tubercles arranged in two rows, giving rise to small tufts of hair. Ocelli present, close to the compound eye and near to

the base of the antennæ. Body moderate, scarcely robust; abdomen cylindric, in the female pointed, conical, in both sexes reaching to or a little exceeding the hind angle of the secondaries. Legs stout, long, well clothed with scales, middle and hind tibiæ with the usual spurs. In the male the fore tibiæ are somewhat modified. The member is short, with a distinct epiphysis and a long process equaling the basal joint of the tarsi, tipped with an acute, curved, corneous spine, and covering a groove in the first tarsal joint in which lies a pencil of fine, hair-like scales. The entire leg structure is much heavier than is usual in this series, and the vestiture is coarse and loose. Wings large, broad, not frail; primaries trigonate, the costa a little depressed centrally, apex rectangular, outer margin curved and only moderately oblique, making the inner margin only a little shorter than the costa.

This is a quite strongly marked genus with a distinct resemblance to *Bomolocha* in its appearance and habitus, yet with the structural features which ally it to *Herminia*. The long, upcurved palpi, terminating in a flat, hatchet-shaped tip, are quite characteristic. The venation is normal, the accessory cell of the primaries being present.

There is only a single species thus far known, and this is of an obscure smoky-brown on which all the usual markings are faintly visible.

Hypenula cacuminalis. Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 37, *Hypena*.

1891. Smith, List Lepidoptera, 63, *Hypenula*.

biferalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 237, *Herminia*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 389, pr. syn.

opacalis. Grote.

1876. Grote, Canadian Entomologist, VIII, 27, *Hypenula*.

1891. Smith, List Lepidoptera, 63, pr. syn.

Ground color a dull, smoky brown, varying in shade, sometimes toward blackish, sometimes toward a richer more reddish tint, often with sprinklings of whitish scales. Entire body concolorous. Primaries with all the usual markings traceable and often quite distinct though never contrasting. Basal line evident, brown, single-toothed. Transverse anterior line single, brown, denticulate, rather evenly outcurved over the cell and somewhat irregularly drawn in below. Sometimes an indefinite yellowish shade follows the brown line, and sometimes it is emphasized by scattering white scales. Subterminal line irregularly dentate and angulate, paler than ground color, usually marked by white scales and often preceded by a darker brown shading. A series of black terminal lunules, sometimes united into a continuous line, and often reduced to small dots. There is traceable a very vague, diffuse median shade. Orbicular small, round, yellow or white, often wanting. Reniform small, narrow, upright, yellowish, marked by a white dot inferiorly and sometimes superiorly as well. Secondaries with a somewhat more yellowish cast, varying in depth, with a discal lunule, a broad median

dark line and a paler subterminal line vaguely visible in most specimens; obsolete in some, and quite distinct in others. The markings are most evident in the paler specimens, and disappear entirely in the dark forms. Beneath more grayish, with coarse brown powderings. Primaries with an exterior dark line and a partial subterminal line which is best marked on the costa; secondaries with the maculation of the upper side more distinctly repeated.

Expanse of wings, 29 to 35 mm. — 1.15 to 1.40 inches.

HABITAT.—Southern States; Florida in April; Texas in May and August.

The species is a marked one, and offers little variation except in depth of ground color. It seems to be not uncommon in its range, specimens occurring in almost all collections.

Genus **HETEROGRAMMA**, Guenée.

1851. Guenée, Species General, Deltoïdes, 91.

1859. Walker, Cat. Brit. Mus., Lep. Heterocera, XV1, 147.

Phalanophana, Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 304.

1881. Smith, Bull. Bkln. Entomological Soc., VII, 6.

Head rather small and not prominent; eyes naked, large, not at all protuberant. Ocelli distinct, situated close to the compound eye and somewhat removed from the base of the antennae, without an evident pointed frontal tuft. Palpi long, compressed, oblique, and clothed with upright scales in the female, recurved and with the scales directed forward in the male, the clothing not excessively long in either case. Tongue moderate in length and strength. Antennae situated on the vertex, well forward, about two-thirds the length of the forewing; simple in the female, with lateral bristles in the male, the joints furnished inferiorly with tubercles from which arise tufts of long hair. Body moderate or slight, abdomen cylindrical, reaching to or a little exceeding the anal angle of secondaries. Legs moderate in length, quite stout; tibiae with the usual spurs.

In the male the anterior tibia is very much abbreviated, anteriorly prolonged into a process which is quite prominent and densely scaled, covering also a mass of specialized scales. The basal joint of the tarsus is very long, exceeding the tip of the tibial process, and near its tip, extending upward, is a peculiar ladle-shaped appendage, the handle quite slender and flattened, the bowl hemispherical nearly and fringed at the edges; externally it is covered with papillate processes, while inwardly it is clothed with long hair. This same structure is also present in *Palthis*, but seems to be absent in all other genera. The wings are broad, rather frail in appearance, trigonate, moderately long, primaries with the costa arched, the apex sharply rectangular, middle of outer margin distinctly though not prominently angulated, a very little excavated from that point to the costa and toward the hind angle quite oblique. Secondaries rounded, a very little retracted opposite

the cell. The venation of the primaries is aberrant, in that the accessory cell is wanting, and veins 7 to 10 arise from the same stalk, with 6 from the end of the subcostal.

I refer the species described by Mr. Grote as *Phalanophana* to Guenée's genus, with which it agrees so far as the description goes. The genus is well marked and readily distinguished by the characters above given.

A single species only is referable here, my *H. palligera* proving not congeneric on careful study of more material.

***Heterogramma pyramusalis*, Walker.**

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 106, *Herminia*.

1893. Smith, Bull. 44, U. S. Nat. Mus., 385, *Heterogramma*,
gyasalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XIX, 856, *Herminia*.

1893. Smith, Bull. 44, U. S. Nat. Mus., 385, pr. syn.
ravigena, Grote.

1873. Grote, Trans. Am. Entomological Soc., IV, 305, *Phalanophana*.

1884. Smith, Bull. Bklu. Entomological Soc., VII, 6, *Heterogramma*.

1893. Smith, Bull. 44, U. S. Nat. Mus., 385, pr. syn.

Ground color varying from pale testaceous to dark luteous, or even smoky gray, in fresh specimens with a more or less marked greenish or olivaceous suffusion, which changes to a peculiar sordid yellowish or tan in old examples. Head and thorax concolorous, abdomen a little paler, with the edges of the segments ringed with whitish. Primaries with the maculation well defined. Transverse anterior line distinct, upright, pale, outwardly margined by a darker olivaceous gray shading, which is outwardly diffuse, extending well into the median space. Transverse posterior line narrow, nearly even, consisting of an olivaceous followed by a pale line, as a whole nearly upright, its course rather irregularly and very slightly sinuate. A somewhat broader median shade crosses the space beyond the middle and parallel to the transverse posterior line. Subterminal line a little paler than the ground color, twice rather markedly bent outward, and with three intervening incurves, emphasized by crossing a darker shade which begins in the middle of the subterminal space, is there rigidly defined and extends into the terminal space, irregularly merging into the ground color before the margin is reached. A series of black or blackish terminal lunules, often connected, but sometimes reduced to venular points. A more or less marked dusky or dark shade extends from the apex obliquely inward toward the cell. Orbicular small, round, concolorous, yellow, brown or black, or entirely wanting. Reniform narrow, upright, centrally constricted, black centered, sometimes reduced to two superimposed black dots. Secondaries paler, more whitish toward the base, crossed by two rather even dark lines continuing the median shade and transverse posterior line, and by a pale line continuing the subterminal line of the primaries. Of these

the inner line is rarely distinct, while the others are fairly well marked in most instances, sometimes becoming obsolete toward the costal margin. Beneath, varying greatly in color and in the distinctness of maculation. Usually all wings have a discal lunule, though this is often absent on the primaries and not infrequently on the secondaries also. All wings also with an extra median dark and subterminal pale line, followed by a series of brown terminal lunules. Sometimes all this disappears, but more usually the tendency is to obsolescence on the primaries only, and rarely, in dark specimens, both the lines will be pale.

Expanse of wings, 20 to 24 mm. = 0.80 to 0.95 inch.

HABITAT.—Canada to Louisiana and Texas; Middle, Central, and Southern States; Missouri in August; Canada in June; New York in May; District of Columbia in August.

This rather common species is quite readily recognized by the peculiar color alone. This is a mixture of a pale clay yellow ground overlaid by a darker, more olivaceous yellow brown, and of this the markings consist. The prominent, rigid transverse anterior line and the equally prominent upright rigid shade in the subterminal space distinguish the species at a glance, even though it varies greatly in the depth of its ground to an almost smoky purplish gray. Fresh specimens are quite handsome.

Genus *GABERASA*, Walker.

1865. Walker, Cat. Brit. Mus., Heterocera, XXXIV, 1197.

Tortricodes, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 105

Eulimneria, Grote.

1878. Grote, Bull. U. S. Geol. Surv., VII, 564.

Head moderate, not prominent, without distinct frontal tuft. Eyes large, not prominent, naked. Ocelli distinct, smaller in the male, close to the compound eye, and rather near the base of the antennæ. Tongue moderate in length, strong. Palpi long, compressed, curved upward, and sometimes rising nearly upright, but not recurved. Vestiture not long, so the joints are not broad as seen from the side; the terminal joint or its vestiture truncate at tip. There is no notable difference between the sexes. Antennæ moderate in length, scarcely exceeding half that of the primaries; simple in the female, in the male with moderate lateral bristles, and inferiorly the joints have shorter fine hair, arising from small tubercles. The body is small, the abdomen slender, cylindrical, reaching to or somewhat exceeding anal angle of secondaries. Legs moderately long and stout, tibiæ with long unequal spurs as usual, the anterior pair modified in the male. The tibia is short, with a narrow, long, membranous anterior process, not equaling in length the basal joint of the tarsi, and without special modified scales, tufts, or pencils of hair. Wings moderate, primaries rather elongate and narrowed, differing in the sexes.

In the female the apex is marked and the outer margin is distinctly produced or angulated at its middle, slightly excavated between that point and the apex, and quite oblique to the hind angle. In the male the apex is obtuse and the wing is cleft from the middle of the margin inwardly nearly to the transverse posterior line, each corner of each lobe thus formed rounded. In venation the male is just enough modified to accommodate the modification of the wing, and the origin of all veins is as in the female. This is out of the usual course, in the absence of the accessory cell, and in the fact that vein 10 arises out of the subcostal before the end, instead of from the same point with 7 to 9, which are on one stalk. With both sexes at hand the genus is recognizable at a glance. With the female only there is a decided resemblance to *Heterogramma*, but the wings are narrow, quite different in color, and the venation is decisive, if that be referred to. This is the only one of our genera in which the wings are lobed or cleft in the male, and we have only a single species, which is hence recognized with the genus. It is interesting to note that the tibial process has become much reduced here, though the tibia itself is very much abbreviated. I have seen a second allied species from the West Indies, in which the palpi are more strongly recurved and which have a tuft or fringing of scales on the costa. This is the typical *Tortricodes* of Guenée, and not congeneric with our more northern form.

Gaberasa ambigualis, Walker.

1865. Walker, Cat. Brit. Mus., Heterocera, XXXIV, 1198, *Gaberasa*.

♂ *bifidalis*, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 105, *Tortricodes*.

1878. Grote, Bull. U. S. Geol. Surv., VI, 564, *Eulintneria*.

1893. Smith, Bull. 44, U. S. Nat. Mus., 395, pr. syn.

♀ *indirialis*, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 106, *Tortricodes*.

1873. Grote, Trans. Am. Entomological Soc., IV, 308, *Heterogramma*.

1878. Lintner, Entomological Contributions, IV, 110, ♀ *bifidalis*.

Ground color a somewhat pale reddish-brown. Head and thorax concolorous; abdomen with a luteous admixture, the edges of the segments narrowly pale ringed. Primaries with the markings richer, deeper brown, the basal space clearly and evenly tinted, but all beyond more or less smoky. Basal line evident in some specimens. Transverse anterior line upright or a little inwardly oblique from costa to hind margin, broad, brown, outwardly diffuse, forming the most prominent ornamental feature of the wing. Transverse posterior line slender, rivulous, and irregularly denticulate and sinuate. A usually distinct, rather broader median line, which is more even, but in general course very nearly parallel to the transverse posterior line. Subterminal line pale, preceded by a darker shade, becoming obsolete toward the inner margin, outwardly angulated below the apex and again at the middle of its course. An oblique, somewhat undefined brown apical

streak. A series of blackish terminal dots, sometimes forming a nearly continuous line. Orbicular small, brown ringed and white centered, often wholly wanting. Reniform narrow, upright, marked as a white lunule, reduced to two white dots, or entirely wanting. So far as the ornamentation is concerned the sexes are alike, except that in the male the cleft of the primaries interrupts the course of the subterminal line, this line is much more angulated below the apex, and the shade preceding it is blackish at that point. A black spot marks the lower angle of the upper lobe, and a prominent black lunule marks the inner limit of the incision. Secondaries luteo-fuscous, darker in the male, paler at the anal angle, crossed by a dark median and a pale subterminal line. There is also a narrow, sometimes interrupted black terminal line, and a dusky discal lunule, the latter often absent. Beneath, paler, reddish gray, both wings with a dusky extra median and a pale subterminal line, the latter frequently in great part obsolete. A dusky discal lunule on the primaries, and a rather prominent black lunule on the secondaries.

Expanse of wings, 22 to 25 mm.=0.90 to 1 inch.

HABITAT.—Canada to Texas; Central States; New York, May and August.

There is little variation in this species except in ground color, and that is extremely slight. The most prominent ornamental feature is the broad, outwardly diffuse transverse anterior line, and in the male the black mark terminating the incisure. On comparison a very close correspondence will be noted between the markings of this species and those of *Heterogramma pyramusalis*, and the genera are certainly related.

The other peculiar features of the species have been alluded to under the generic heading. It is rather common in most portions of its range.

Genus *DERCETIS*, Grote.

1878. Grote, Bull. U. S. Geol. Surv., IV, 186.

Head moderate; eyes large but hardly prominent; front smooth, with a distinct interantennal tuft. Ocelli distinct, situated close to the compound eye and to the base of the antennæ. Palpi long, projected straight forward or a little oblique, practically alike in both sexes, with the usual upright vestiture, the terminal joint pointing upward, the vestiture coarse and somewhat imperfectly truncated at the tip, making it somewhat triangular. Tongue moderate, or rather weak. Antennæ moderate in length, set well up on the vertex and not encroaching at all on the front. In the female they are simple, in the male pectinated, the pectinations proportionately very stout and coarse, not extending to the tip, differing quite markedly in the species and without special modifications. Body moderate, abdomen conic, cylindrical, slightly or not at all exceeding the anal angle of the secondaries. Legs long, closely scaled, the tibiæ spurred as usual. In the male the fore tibia is somewhat shortened, with a moderate extended process anteriorly, not

reaching the tip of the elongated first tarsal joint, and not covering any brush or pencil of hair or specialized scales. The wings are characteristic; the primaries are broadly trigonate, the apex acute, the outer margin distinctly angulated at the middle, excavated between that joint and the apex and markedly oblique toward the hind angle. The secondaries have the outer margin somewhat retracted opposite the cell. The venation is probably somewhat variable on the primaries. As described by Mr. Grote no accessory cell is present, and so it seems on one specimen examined without denuding. On a bleached wing before me the accessory cell is present, though narrow, and vein 10 arises from this; the venation is quite normal in fact. It is probable that the cell may be frequently absent or so reduced as to appear so, and in such cases 8 and 10 will seem to or actually arise from the subcostal. On the secondaries in the specimen under examination veins 3 and 4 are on a stalk beyond the end of the cell, while 5 is out of the median by a short curved branch or loop.

This genus is a well-marked one and quite characteristic. The angulated wings it shares with *Palthis*, but they are wider and comparatively shorter. The palpi offer nothing unusual. The fore tibiae of the male show the characters of the *Herminia*, but in a very reduced form, and no brushes or tufts of hair or scales are present. The antennae in the male are remarkably coarse, with rough vestiture, long joints, and heavy pectinations.

Two species are described, both of them small and light purplish gray in ground color.

Vitreæ is the larger, somewhat broader winged, with a reddish or brown suffusion and a white reniform. The pectinations of the male antennae are long and stout, about twice the length of the joints, laterally ciliated, and with long, slender bristles near tip.

Pygmaea is decidedly smaller, darker, more purplish gray in color, the reniform yellow, with a central dark lunule. The pectinations of the male antennae are hardly longer than the joints, irregularly set with rather long, fine hair and with a very long, moderately stout bristle at their base, arising out of an enlargement of the joint itself rather than of the pectination.

The species are not common and rarely represented in collections; perhaps because they have been considered as micros.

Dercetis vitrea, Grote.

1878. Grote, Bull. U. S. Geol. Surv., IV, 187. *Dercetis*.

Ground color light purplish gray, with a faint reddish suffusion. Head, thorax, and abdomen paler, nearly white. Primaries with a reddish suffusion over the costal region, becoming more prominent and diffuse to the transverse posterior line, beyond which it does not extend. Transverse anterior line slender, brown, irregular in course, and variably outcurved in the interspaces. Transverse posterior line

slender, denticulate or crenulate, as a whole quite evenly outcurved, sometimes a little drawn in below the submedian vein. Subterminal line vague, denticulate, dusky, emphasized by white scales outwardly, sometimes scarcely traceable. A series of small terminal black dots, more prominent in the excavation below apex. Orbicular wanting in my specimens. Reniform upright, white, outwardly shaded by rusty red brown, which sometimes divides it centrally. Secondaries whitish, a little stained outwardly or toward anal angle, with a faint crenulate discal line continuing the transverse posterior line of primaries and a series of distinct, blackish terminal lunules. Beneath paler: primaries with the costal and outer margin stained with brown and with an outer line, which is well marked on costa only. Secondaries more coarsely powdered, with a discal dot, and the markings of the upper side faintly reproduced.

Expanse of wings, 18 to 20 mm. = 0.72 to 0.80 inch.

HABITAT.—New York and Texas in July; Illinois in May; Eastern and Central United States.

I have never had any large number of specimens of this species, and have never seen any reaching in size those mentioned by Mr. Grote: 25 mm, which is probably an error. The only variation apparent in the specimens before me is in the ground color and the consequent relative distinctness of the transverse maculation.

Dercetis pygmæa, Grote.

1878. Grote, Bull. U. S. Geol. Surv., IV, 187. *Dercetis*.

Ground color purplish gray, darker than in *D. ritrea*, but with essentially the same markings. There is a somewhat more reddish suffusion through the center of the primaries, but no determinate shading. The reniform is yellow, with a central lunule, and the transverse posterior line is a little more even than in its ally.

Expanse of wings, 14 to 16 mm. = 0.60 to 0.70 inch.

HABITAT.—Florida; Texas in July.

The smaller size, darker color, and yellow reniform will readily distinguish the species. It is obscurely marked and the description would be closely a repetition of that of *D. ritrea*. It seems more rare than its ally, but will probably be found in others of the Southern States.

Genus **PALTHIS**, Hübner.

1816. Hübner, Verzeichniss, 312.

1859. Walker, Cat. Brit. Mus., Lep. Heterocera, XVI, 151.

Clanyma, Guenée.

1854. Guenée, Species General, Deltoides, 95.

Mardara, Walker.

1859. Walker, Cat. Brit. Mus., Lep. Heterocera, XVI, 157.

Head moderate; eyes comparatively large, globose, naked. Front with an interantennal tuft. Ocelli on the vertex, close to the compound eye and some distance back from the base of the antennæ,

which are inserted well toward the front. Tongue moderate. Palpi very long; in the female directed straight forward, the terminal joint set nearly at right angles to the second and pointing upward; very much flattened, the upright scales unusually long, and on the terminal joint dilated at tip and almost squarely cut off. In the male the palpi are shorter, recurved, with a membranous appendage to the third joint, which extends back to the base of the thorax and contains a pencil of fine yellow hair, capable of fanlike expansion. Antennae long, extending to the outer fourth of the primaries; in the female simple, in the male with lateral bristles, varying in the species. Legs long and stout; middle and hind tibiae with the usual spurs; in the male the anterior legs have the tibia extremely short; but with a large and broad outer process, densely clothed inwardly with long broad scales, and covering a groove on the basal joint of tarsus in which lies a pencil of fine hair which seems not capable of fanlike expansion. The unusually dense mass of long, broad scales gives the process a moplike appearance toward the tip. When the process is moved aside from the tarsus it is seen to have a slender membranous extension at the tip, while at the base of the tarsus is a movable fingerlike member, dilated at the tip and furnished with hooks. I have met with this elsewhere in the present series in only one instance, and have no suggestion to offer concerning its probable use. Primaries narrow, elongate, the costa depressed toward the middle, convex before the apex, which is acute and somewhat prominent. Outer margin somewhat excavated below the apex, obtusely angulated at or above the middle, oblique thence to the inner margin, which is about one-third shorter than the costa. In venation it lacks the accessory cell, and veins 6, 7, 8, and 10 arise nearly together from the end of the subcostal, 9 out of 8 before the apex. The body is moderate, the abdomen slender, cylindrical, extending to or a little beyond the anal angle of the secondaries.

This genus is readily recognized by the narrow, angulated primaries and by the peculiar palpal structure of both sexes. No other genus in our fauna has the peculiar appendage bearing an expansible brush or pencil of hair in the male. The structure of the fore legs in the latter sex is after the *Herminia* type, though characteristically modified as above described.

We have two species which are readily distinguishable, and yet very similar. *P. angulalis* is somewhat the larger, with rusty, red brown markings over a more yellowish base, and a yellow patch in the excavation on the outer margin below the apex. The sub-terminal line has a small W at the middle.

P. asopialis is smaller, darker, more purplish brown, the marking blackish, while a blackish patch on the excavation below apex replaces the yellow of *P. angulalis*, and the W of the subterminal line is much more prominent, usually extending to the margin and completely cutting the terminal space. Structural characters are also present, readily

separating the two. In *P. angularis* the male antennal joints are moderately long, not marked when denuded, and only slightly so when clothed with scales, with moderate slender lateral bristles, and quite a dense fringing of shorter cilia beneath; each arising from a small tubercle or sensory pit. The female palpi are also longer. *P. asopialis* has the antennal joints in the male shorter, more marked, the lateral bristles longer and stouter; but the ciliations from sensory pittings much reduced in number. The palpi of the female are somewhat shorter, but the terminal joint is longer and very much broader; altogether more largely developed.

The species are common and are coincident in range, covering the entire Eastern and Central United States, extending north well into Canada and southwesterly into Texas.

ANALYSIS OF THE SPECIES OF *PALTHIS*.

Larger; rusty red brown; a yellow blotch below apex of primaries.....*ANGULARIS*.
Smaller; purplish brown; a black patch below the apex of primaries.....*ASOPIALIS*.

Palthis angularis, Hübner.

1796. Hübner, Schmetterlinge Europas, Pyr., fig. 107, *Pyralis*.
1816. Hübner, Verzeichniss, 342, *Palthis*.
1825. Treitschke, Schmetterlinge Europas, V, 36, *Hyppena*.
1852. Herrich-Schaeffer, Europäische Schmetterlinge, 382, *Herminia*.
1854. Guenée, Species General, Deltoides, 95, *Clanyma*.
1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 152, *Palthis*.
1872. Grote, Trans. Am. Entomological Soc., IV, 107, *Clanyma*.
1873. Grote, Trans. Am. Entomological Soc., IV, 309, *Palthis*.
aracanthusalis, Walker.
1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 157, *Mardara*.
1893. Smith, Bull. 44, U. S. Nat. Mus., 385, pr. syn.

Ground color varying from yellowish or rusty red brown to purplish. Head and thorax concolorous, abdomen paler, less brown. Primaries with the markings distinct and contrasting. Transverse anterior line slender, single, a little oblique inwardly, but outwardly convex. Transverse posterior line slender, single, brown, rather evenly bisinuate. Subterminal line rarely complete, pale, rather even except at about middle, where it is best marked and forms a small W, which in none of the specimens seen by me crosses the terminal space. A brown, continuous terminal line. There is a broad oblique median shade which is somewhat vague and indefinite from the costa to the median vein, there becomes a rich velvety brown, sharply defined inwardly but diffuse outwardly, broadest on the internal margin. Orbicular small, yellow or brown, or entirely wanting. Reniform oblong, oblique, rich velvety brown in color, with a concolorous central line. Along the costa before the apex is usually a richer brown shade, below which on the outer margin is a somewhat lunate yellow patch, varying somewhat in prominence, and this in turn is inferiorly followed in the terminal space by a somewhat darker shading which is sometimes little marked.

Secondaries whitish to yellowish, or fuscous, with a yellow or brown or smoky shade on the outer margin before the anal angle; crossed by a narrow dark line which is continuous with the subterminal line of primaries. A narrow brown line at base of the fringes, which nearly agree in color with those of the primaries. Beneath paler, powdery, both wings with the outer lines of upper side reproduced, on primaries much less, on secondaries rather more distinctly; secondaries also with a discal spot.

Expanse of wings, 22 to 25 mm.=0.90 to 1 inch.

HABITAT.—Canada in June; New York, June to August; District of Columbia in May; Missouri, May and June.

This pretty little species is quite common throughout its range and comes readily to light. Its chief differential features have been already pointed out, and the species should not be difficult of recognition.

Palthis asopialis, Guenée.

1854. Guenée, *Species General*, *Deltoides*, 96, *Clangyna*.

1859. Walker, *Cat. Brit. Mus.*, *Heterocera*, XVI, 152, *Palthis*.

1872. Grote, *Trans. Am. Entomological Soc.*, IV, 108, *Clangyna*.

1873. Grote, *Trans. Am. Entomological Soc.*, IV, 309, *Palthis*.

Ground color a purplish dark brown. Head and thorax concolorous; abdomen a little paler. Primaries with the maculation fairly well marked, sometimes prominent. Transverse anterior line single, narrow, blackish or brown, even, outwardly bent over the costa; but as a whole, inwardly oblique. Transverse posterior line narrow, dark, irregularly dentate and angulated; as a whole outcurved, with a small indrawing in the submedian interspace. Sometimes the line is accompanied by a narrow paler shading, which, however, is not prominent. Subterminal line narrow, pale, outwardly oblique from costa, forming a prominent W at the middle, which cuts the terminal space to the outer margin. A narrow, dark, terminal line. An oblique, broad, median shade, which is sometimes obscure for its entire course; but more usually becomes prominent, velvety blackish brown below the median vein, but does not expand much on the inner margin. Orbicular, a black dot or wanting. Reniform variable; sometimes an almost upright black mark annulate by pale scales; sometimes a large, more or less indefinite black blotch, with all sorts of intergrades. The apex is concolorous; but below it and to the W of the subterminal line the terminal space is black filled, and quite usually the dark filling extends through the inferior portion of the same space, though not contrastingly. Secondaries blackish gray or fuscous, with an outer dusky and a pale subterminal line, the latter preceded by a darker shade. A darker indefinite blotch before the anal angle. Beneath, smoky or blackish, powdery, with the outer lines of upper side reproduced more or less perfectly.

Expanse of wings, 21 to 23 mm. = 0.84 to 0.92 inch.

HABITAT.—With *P. angulalis*, and at same dates.

This species is perhaps the less common, especially in the more northern part of its range, and is readily distinguishable by its smaller size and darker color, and by the dentate transverse posterior and subterminal lines, as well as the black patch below the apex. The reniform here also is black, and often a large blotch, differing in form. In *P. angulalis* the reniform is always oblique from below outward, while in this species the opposite tendency prevails, though it is by no means constant. The structural and other points of difference have been already pointed out elsewhere.

Genus **CAPIS**, Grote.

1882. Grote, Canadian Entomologist, XIV, 20, 119

1882. Smith, Canadian Entomologist, XIV, 100.

1882. Grote, Papilio, II, 185.

Head moderate or rather small, front narrower in the male. Eyes rather small, though prominent, globose, naked. Tongue moderate. Palpi oblique or nearly straight, varying in the same sex, well exceeding the head, but not excessively long. Second joint with rather loose, scaly clothing, directed both upward and downward; the joint therefore somewhat enlarged at the tip. Third joint less than one-half the length of the second, smoothly clothed, not pointed. Front without a pointed tuft. Antennae simple in the female; feebly ciliate in the male; moderate in length. Body moderate, thorax proportionately small; abdomen reaching to, but hardly exceeding the anal angle of the secondaries. Legs stout, smoothly scaled, the ordinary spurs of middle and hind tibiae long, stout, unequal. Anterior femora in the male somewhat enlarged basally and grooved inferiorly, but not otherwise modified. Primaries moderate, broad, rather abruptly widened at base, the outer margin even, arched, only a little oblique, hence the costal and inner margins of nearly the same length. Venation normal. Secondaries proportionate. Venation normal, save that 3 and 4 are often on a stalk, and vein 5 is distinctly weaker than the others.

There is only a single species thus far described, and as based on this the genus is readily distinguished from all others by the broad, obtuse wings, which are suddenly widened at base and not trigonate, and by the comparatively short palpi. Indeed, the genus on analysis shows the deltoid characters somewhat obscurely.

Capis curvata, Grote.

1882. Grote, Canadian Entomologist, XIV, 20 and 119, *Capis*.

1882. Smith, Canadian Entomologist, XIV, 100, *Capis*.

1882. Grote, Papilio, II, 185, *Capis*.

1883. Grote, Canadian Entomologist, XV, 6, *Capis*.

Ground color a glistening smoky or bronze brown, varying to blackish. Head and thorax concolorous, abdomen paler, glistening gray. Primaries almost evenly of the ground color to the subterminal line

which is white and extends quite rigidly oblique or a little incurved from the apex to within the hind angle. Beyond this line the terminal space is more or less sprinkled with white scales, and there is a white terminal line. In the paler specimens there is a trace of a black clavi-form. In most specimens the orbicular is visible as a white dot, often marked by a few black scales, and the reniform is marked by a few white and black scales forming no definite markings. Secondaries even, smoky gray, immaculate. Beneath smoky, varying in tinge, in the paler specimens with a discal lunule.

Expanse of wings, 20 to 23 mm.=0.85 to 0.90 inch.

HABITAT.—Canada in July; Maine, New York, New Hampshire, Northern Atlantic and Northern Middle States.

This species seems to be not rare in the more northern part of its range, and is very readily recognized. The smoky-brown glistening primaries, cut toward the outer margin by the white subterminal line and paler terminal space, are characteristic and distinctive of this species.

Genus *SALIA*, Hübner.

1816. Hübner, Verzeichniss, 339.

Colobochila, Hübner.

1816. Hübner, Verzeichniss, 314.

1859. Walker, Cat. Brit. Mus., Lep. Heterocera, XVI, 18

Madopa, Stephens.

1827. Stephens, in Curtis' British Insects, 159.

1857. Lederer, Nocturnen Europas, 212.

Head moderate, eyes prominent though not large, naked. Tongue strong, moderate in length. Ocelli distinct, situated close to the compound eye and rather close to the base of the antennae. The latter are moderate in length or rather short, simple in the female, feebly ciliated in the male. Palpi oblique, stout, with the pointed frontal tuft forming a snout; the second joint longest, clothed with upright scales; terminal joint short, obtuse, and divaricate at tip. Thorax moderate, abdomen conic, pointed at tip, reaching to but hardly exceeding the anal angle of secondaries. Primaries rather elongated, trigonate, apex pointed, outer margin oblique, rounded, leaving the inner margin about one-fourth shorter than the costa. Venation normal. Legs stout, normal in both sexes. This genus is distinct by the rather short, oblique palpi, which scarcely exceed the frontal tuft, and by the pointed, rather narrow wings, with three subparallel oblique transverse lines.

We have two rather rare species in our fauna, and one is identical with a European species, if the locality on the specimen is correct. Of these, *S. interpuncta* is the smaller and has the ordinary spots indicated, while *S. salicalis* is much larger and has no trace of orbicular or reniform. Of the latter species I have seen only one specimen, given me by Mr. Grote and labeled Texas. It seems to agree perfectly with European specimens, and it may be an imported form with an erroneous locality.

Lederer says of the early stages, that the larva is uniform velvety green, with but 14 legs, and lives in August in willows, the moth making its appearance in May and June.

According to Guenée the caterpillar has the incisions yellowish, the head concolorous, and the stigmata black.

ANALYSIS OF THE SPECIES OF *Salia*.

Smaller; the ordinary spots always indicated and usually well marked. *INTERPUNCTA*.
Larger; ordinary spots wanting..... *SALICALIS*.

Salia interpuncta, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 93, *Madopa*.
1873. Grote, Trans. Am. Entomological Soc., IV, 309, *Colobochila*.
1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 170, *Colobochila*.
1875. Grote, Bull. Buff. Soc. Nat. Sci., II, 223, *Salia*.
1880. Grote, Canadian Entomologist, XII, 220, *Salia*.
saligua, Zeller.
1872. Zeller, Verh. k. k. Zool. Bot. Ges., XXII, 462, *Colobochila*.
1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 170, pr. syn.
rufa, Grote.
1883. Grote, Canadian Entomologist, XV, 31, *Salia*.

Mr. Grote's descriptions are as follows:

"*Madopa interpuncta*, Grote.—Primaries dark-shaded pearly gray, finely irrorate with black scales, with three nearly equidistant transverse even brownish lines preceded by pale coincident shades, the first line nearer the second, while the third is slightly arcuate, continued from apices to internal margin within the angle. Between the first and second lines a black dot on the disk, the orbicular. Beyond, but approximate to the second line, a larger black dot, the reniform. A series of minute interspaceal terminal dots. These are more continuous on the pale secondaries, which show a discal dot beneath. Legs darker than the body parts and abdomen above. Expanse, 20 to 22 mm."

"*Salia rufa*, n. s.—Primaries brownish gray, crossed by three oblique, yellowish, narrow lines. Inner line with a costal projection. The first discal dot is close to it. The middle line is a little waved and followed by a diffuse black shading, which obscures the outer discal dot. The outer line is a little bent at the middle, and loses itself to apex. The subterminal field which follows is suffused with reddish brown and limited by a very fine irregular line; terminally the wing is again brownish gray and shows a faint festooned line; fringes paler, a little brownish. Hind wings fuscous gray with brownish fringes beneath, with black discal dot and outer line, the surface paler, irrorate. Arizona Coll., B. Neumoege, esq. Expanse, 22 mm."

Expanse of wings, 20 to 22 mm.=0.80 to 0.90 inch.

HABITAT.—Massachusetts to Florida; Texas, Arizona.

To the courtesy of Mr. Grote I owed a type of *Salia rufa*, which is now in the collection of the United States National Museum, and I have

also a specimen of *S. interpuncta* from the same region, Arizona. There is a little variation in ground color and the amount of shading to the transverse lines, and this is really all that separates the nominal species described by Mr. Grote.

The species does not seem to be common anywhere within its range, and it is found in very few collections only.

Salia salicalis, Fabricius.

1794. Fabricius, *Entomologia Systematica*, III, 369, *Pyralis*.

1854. Guenée, *Species General*, *Deltoides*, 22, *Madopa*.

1858. Walker, *Cat. Brit. Mus.*, *Heterocera*, XVI, 18, *Calobochyla*.

Ground color pearl gray, with black, rather sparse powderings. Head and thorax concolorous; abdomen more luteous or smoky. Primaries with three even inwardly oblique fascia, consisting of a brown and a yellow line or shade, the latter following the basal line, but preceding the others. The inner line is either abbreviated on the costal vein or it reaches the costa, bending inwardly on the vein. The middle fascia crosses at just about the center of the wing, while the outer is incurved from the apex to the margin close to the hind angle. The ordinary spots are obsolete. Secondaries smoky or yellowish, a little darker outwardly, with a trace of a pale subterminal line toward the inner margin.

Expanse of wings, 28 mm. = 1.12 inches.

HABITAT.—Texas.

The species is easily recognized, differing by its larger size and absence of all trace of the ordinary spots from the more common form. The bibliography above given is, of course, extremely incomplete, and Walker and Staudinger should be referred to. There has been no reference to the species in American publications so far as I am aware, and, as I have already indicated, the American habitat of the species is not at all beyond doubt.

Genus *BOMOLOCHA*, Hübner.

1816. Hübner, *Verzeichniss*, 343.

1857. Lederer, *Noctuiden Europas*, 214.

Meghyppena, Grote.

1873. Grote, *Bull. Buff. Soc. Nat. Sci.*, I, 86.

Macrhyppena, Grote.

1873. Grote, *Bull. Buff. Soc. Nat. Sci.*, I, 38.

Eulhyppena, Grote.

1873. Grote, *Bull. Buff. Soc. Nat. Sci.*, I, 38.

Lederer describes this genus as follows: More robust than the previous genus (*Pechipogon*); the abdomen shorter, the primaries more pointed, nearer to the following *Hypena*. Front with a pointed tuft. Palpi horizontal, exceeding the head by more than its own length; beneath closely scaled, with a knife-like edge above, the terminal joint small, pointed. Tongue spiral. Eyes naked, their margins with stiff

bristly lashes. Antennæ bristlelike, in the male with short, even cilia. Thorax woolly, densely clothed, rather more convex and stouter than in its allies. Abdomen closely scaled, with hairy dorsal tuftings. Breast and femora with dense, long, woolly clothing. Tibiæ closely hairy or scaly.

With the above characterization our species agree fairly well, save that there is a very great variation in the degree of the "lashing" of the eyes, this being never prominent, and usually practically wanting. The primaries are large and broad, proportionate to the secondaries, which are not usually developed, and this character is really all that separates the genus from *Hypena*. In all the other essential characters the genus agrees with *Hypena*, including therein the absence of sexual modifications in the male, except the somewhat more robust body, more woolly clothing, more evident dorsal tufts, and somewhat shorter and more oblique palpi. The palpi vary in length quite considerably, but are not excessively long in any instance: longest in the largest and smallest of the species, which are most aberrant from the others referred to here.

A very distinct sexual difference which has not been heretofore appreciated is that the males are larger, darker, and decidedly more robust or woolly than the females. This feature unites species that have been heretofore considered as undoubtedly distinct by all students, including myself, and I desire to credit Mr. Butler with the suggestion that first induced me to examine the specimens as to sex and the relation of the so-called species to each other. The venation is normal in both wings. The primaries are trigonate; the costa a little sinuate, depressed centrally; the apex a little produced; outer margin quite strongly outcurved, only moderately oblique, a little excavated below the apex; fringes sometimes feebly scalloped.

We have in our fauna two quite distinct series.

In the first the median lines are irregular, particularly the transverse posterior, and the median space is decidedly darker, contrasting as against the pale, often whitish, subterminal space.

In the second the transverse posterior line is much more even, at most a little angulated, and there is no sharp contrast between the spaces. These features are not to be too strictly construed, for there is quite a difference in shading, not only between specimens of the same sex but yet more between the sexes. However, by contrasting *B. baltimoralis*, of the first series, with female *B. achatinalis*, of the second, the difference attempted to be indicated will be readily appreciated.

At the head of the first series I place *B. manalis*, in which neither transverse anterior nor transverse posterior line reach the hind margin, but unite so as to inclose a rhomboidal dark-brown median space, all the rest of the wing being decidedly paler.

Following this come two species in which the transverse anterior line apparently does not reach the costa, but starts from the base on

the median vein and curves outwardly to the submedian vein, where it is practically lost, the inner margin being pale to the transverse posterior line, which also is faint in this portion of its course. The median space is dark brown above the submedian vein, contrasting with the white lines defining it.

In *B. baltimoralis* the transverse posterior line is irregular, outwardly bent over the cell, thence very oblique and irregular to the submedian vein.

In *B. bijugalis* the transverse posterior line is nearly upright, with a single sharp outward tooth opposite the cell.

B. scutellaris has the median lines complete, white, the transverse anterior outwardly oblique, the transverse posterior nearly as in *B. bijugalis*, but more uneven. The contrasts are not as great as in the other species, yet, in the female especially, the median space is distinctly darker, and in the same sex the subterminal space is white or gray, while it is more smoky in the male.

B. abalinealis has the wing more uniform in color, but with contrasting white transverse lines, of which the transverse posterior makes a long outcurve at its middle, making the median space usually wide. Beyond this the wing is more or less mottled with bluish white.

In the second series the median lines are much more even, not white or contrasting, while the median space does not contrast solidly with the rest of the wing, the tendency in this series being to lose the lines altogether. Two divisions are indicated by palpal structure, the usual form being stout, oblique, and only moderate in length, while in two species they are straight and very long, equaling head and thorax combined.

Of the first division of the second series the best marked is *B. deceptalis*, which has both the median lines pale, the transverse posterior with a single small outward bend over the cell, which is not infrequently wanting. In the female the color is quite decidedly paler, and beyond the transverse posterior line the wing is quite strongly powdered with bluish white. The male is smoky brown throughout, yet even here there is a bluish tinge marked through the outer part of the wing. To this species comes *B. perangulalis*, Harvey, which is, from the description, a male form, and agrees with Walker's variety γ from the description.

Allied to the preceding is *B. madefactalis* Guenée, which is based on a female afterwards described as *B. damnosalis* by Walker, and *B. achatinalis* by Zeller. The male has been named *B. caducalis* by Walker and *B. profecta* by Mr. Grote. It is darker in both sexes than *B. deceptalis*, the transverse anterior line nearly or quite obsolete, the transverse posterior line rarely pale edged, rather marked by the slight contrast between the more even median space and the more or less violet or bluish tinged subterminal space, with a small outward angulation on the median vein and another in the submedian interspace. This character is constant in both sexes, though often obscured in the male, which is very dark smoky brown, and also the most robust of our species.

B. sordidula resembles the preceding, but is decidedly slighter and more obscure. The male is almost immaculate, with the lines barely traceable, except on the costa, while the female has the angles of the transverse posterior line better marked, but the violet or bluish shade of the outer portion of the wing decidedly obscure, powdery, altogether more sordid.

B. torvuta is smoky brown in both sexes, the median lines very slender, rivulous, white, fragmentary; the transverse posterior marked on the internal margin by a prominent, oblong, white spot, which distinguishes the species at a glance.

B. umbralis is a curious form, differing in the more trigonate primaries, the outer margin oblique and little arched. The maculation is all obscure, the transverse posterior line rigid and a little outwardly oblique, starting just a little beyond the middle of the costa.

The two species with long palpi are very different. *B. edictalis* is the largest of all our species; but is less robust than the male *B. madefactalis*. It has the transverse posterior line like *B. deceptalis*, but is altogether a more powdery form with numerous irregular brown transverse strigæ, which give it a distinctive appearance.

B. citata is much the smallest of the species and is perhaps nearer to true *Hyppena* than anything heretofore mentioned, except in the proportionately small secondaries. It resembles *B. umbralis* in having the apparent transverse posterior line crossing near the middle of the forewing.

An ally of this latter will be found, perhaps, in *Erastria mitographa*, Grote. I have seen only one of the types which lacks the wings on one side, and it may not belong here with my present ideas on the genus. I prefer, therefore, to omit it at present and relegate the species to the genus in which it is described until material can be obtained.

B. annulalis also is not represented in the collection before me, and though I have seen the type, which indicates a good and distinct species, I can not add to the somewhat scant description.

Bomolocha incusalis, Grote, belongs to *Pleconectyptera*.

I have a single male specimen from South Dakota which indicates a new species allied to *B. deceptalis*, but this is hardly sufficiently good to form a type.

ANALYSIS OF THE SPECIES OF BOMOLOCHA.

1. Palpi oblique, moderate in length, exceeding the head by little more than its own length 2.
 Palpi straight, exceeding the head by the length of head and thorax combined 7.
2. Median lines of primaries not reaching the inner margin, uniting inferiorly to enclose a contrastingly brown, rhomboid median space.....MANALIS.
 Transverse anterior line not reaching the costa; basal space superiorly brown above the transverse anterior line, inferiorly pale 3.
 Median lines normal, reach both costa and inner margin 4.

3. Transverse posterior line with a strong outward bend over the cell, very irregularly and markedly oblique below BALTIMORALIS.
 Transverse posterior line with an abrupt, sharp angle opposite the cell, its course else nearly upright or only a little sinuate BIFUGALIS.
4. Median lines irregular, more or less white, contrasting, median space darker than the rest of the wing 5.
 Median lines even or only a little angulate, not irregular; basal and median space concolorous, subterminal rarely with strong contrasts, often concolorous 6.
5. Transverse anterior line outwardly oblique, strongly dentate; transverse posterior line sharply produced opposite the cell, irregularly bent and sinuate below SCUTELLARIS.
 Transverse anterior line irregular, hardly oblique; transverse posterior line slender, white, sharply defined, widely and rather evenly outcurved medially ABALINEALIS.
6. Transverse posterior line with a single small angulation on the cell, and even this sometimes wanting DECEPTALIS.
 Transverse posterior line with a small angulation over the cell and another in the submedian interspace; more robust; transverse posterior line in the male marked; colors in the female bright MADEFRACTALIS.
 Slighter; transverse position in the male scarcely traceable, color almost uniform; colors in the female sordid SORDIDULA.
 Transverse posterior line rigid, a little outwardly oblique, starting from nearly the middle of the costal margin UMBRALIS.
 The lines lost, or marked by white scales only; the transverse posterior line with a prominent, oblong white patch on hind margin TOREUTA.
7. Size very large; the wing crossed by numerous brown strigæ EDICTALIS.
 Size very small; the maculation confused CITATA.

Bomolocha manalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 33, *Hyppena*.

1870. Robinson, Am. Lye. Nat. Hist., N. Y., IX, 311, *Hyppena*.

1872. Grote, Trans. Am. Entomological Soc., IV, 163, *Hyppena*.

1873. Grote, Trans. Am. Entomological Soc., IV, 309, *Bomolocha*.

Ground color a pale brown, varying to whitish in the female and to smoky in the male. Head and thorax concolorous; the abdomen a little paler. Primaries with the median space a rich uniform brown, often velvety in appearance, contrasting strongly with the remainder of the wing, though less so in the male. The median lines are connected inferiorly; the transverse anterior very oblique, even, white, extending to the internal vein, on which it meets and joins the transverse posterior line. This is also white, starts a little outwardly oblique, is then prominently exerted and then again inwardly oblique to the internal vein, inclosing thus between the two lines a rhomboidal patch, which is the median space, neither of the median lines reaching the inner margin. Transverse posterior line punctiform, white, preceded by blackish spots, a little sinuate and variably distinct, more evident in the male as a rule. At the apex is a paler triangle, inferiorly margined by a dark brown oblique shade, which is frequently broken into three oval blotches, and this shade nearly meets the outward bulge of the median space. A slender, pale, terminal line. The paler shade of the wing includes

all the basal space, continued below vein 1 to meet the same shade from the outer portions of the wing, where it darkens toward the oblique apical patch. The orbicular is not marked in any of the specimens now before me, but the reniform is indicated in some by a few raised black scales, forming a more or less evident lunule. Secondaries smoky gray to brown, darker in the male, the secondaries with a usually evident discal lunule and an occasionally marked median line.

Expanse of wings, 23 to 27 mm. = 0.90 to 1.06 inches.

HABITAT.—Canada to District of Columbia; Minnesota; Iowa: District of Columbia in June.

This is a very pretty, very distinct, and not very common species, which is recognizable at once by the peculiar shape of the median space, inwardly marked by the united median lines.

In the male the paler shade has just a feeble violet tinging.

***Bomolocha baltimoralis*, Guenée.**

1851. Guenée, *Species General*, Deltoïdes, 34, *Hypena*.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 31, *Hypena*.

1870. Robinson, *Ann. Lye. Nat. Hist.*, N. Y., IX, 310, *Hypena*.

1872. Grote, *Trans. Am. Entomological Soc.*, IV, 102, *Hypena*.

1873. Grote, *Trans. Am. Entomological Soc.*, IV, 309, *Bomolocha*.

1873. Grote, *Canadian Entomologist*, V, 226, *Bomolocha*.

1882. Packard, *Papilio*, II, 181, larva.

benigualis, Walker.

1859. Walker, *Cat. Brit. Mus.*, Heterocera, XVI, 32, *Hypena*.

1870. Robinson, *Ann. Lye. Nat. Hist.*, N. Y., IX, 310, pr. syn.

1873. Grote, *Canadian Entomologist*, V, 226, pr. syn.

laciniosa, Zeller.

1872. Zeller, *Verh. k. k. Zol. Bot. Ges.*, XXII, 164, pl. II, fig. 8, *Hypena*.

1873. Grote, *Canadian Entomologist*, V, 226, pr. syn.

Ground color brown, varying in shade. Head brown, with gray scales intermixed, the latter sometimes predominating. Thorax with the collar brown, gray tipped, dorsum brown anteriorly, posteriorly gray; sometimes the entire thorax gray, and sometimes entirely brown with a gray admixture. Abdomen fuscous. Primaries with the median space dark brown to blackish, this shade extending through the basal space and obscuring the transverse anterior line, which is faintly marked on the costa. The inferior portion of basal space is more or less white powdered, this pale shading extending beneath vein 1 and connecting with the similar shading beyond the transverse posterior line. The transverse anterior line extends apparently from the costa at the extreme base of the wing obliquely outward to the submedian vein at one-fifth of its distance from base, then bends backward and downward to the margin, very feebly marked below the vein. As a matter of fact, the true transverse anterior line is superiorly obsolete or only traceable, and a longitudinal line joining it below the cell gives a false impression, which is conveniently utilized for descriptive purposes. The transverse posterior line is black, followed by a white line,

and this in turn by a fainter yellow brown line. From the costa it is outwardly oblique with a marked inward curving to vein 5, then nearly straight to vein 6, forming an obtuse spur and greatly oblique inwardly, unequally marked on the veins, and reaching the inner margin close to the transverse anterior line in the female, but a little more remote from it in the male. Subterminal line punctiform, consisting of black and white dots and scales, sometimes forming a subcontinuous line, but more usually entirely obsolete. A very prominent diffuse black streak extends from the apex inwardly nearly to the outward angulation of the transverse posterior line. A series of small, black terminal lunules. The median space is sometimes evenly colored, brown, varying almost to blackish, sometimes darkest inferiorly, and with a more rosy suffusion toward the costa. Orbicular, a small round dot of raised scales. Reniform, a slender black lunule, also of elevated scales. These markings are variably evident, most prominent, of course, in the paler specimens, and apparently obsolete in the darker. Secondaries even, smoky fuscous, varying in tint. Beneath, smoky gray to fuscous, with a variably evident common outer line, and on secondaries a discal spot or lunule.

Expanse of wings, 25 to 35 mm.=1 to 1.40 inches.

HABITAT.—Nova Scotia to District of Columbia; west to the Central States: June to August.

This is not an uncommon species, and offers a number of distinctive features. The forewings are narrower and more pointed than in any other; the outer margin is very oblique, only a little rounded, and not at all produced medially or excavated below the apex, while the fringes are feebly scalloped. The contrasts between the dark median and paler surrounding spaces are variably marked, from white to gray, brown, the darker specimens being males, as a rule. A variable feature is the distance between the median lines on the inner margin, and as a rule the transverse posterior line is much the most distinct, crossing the space below vein 1.

Guenée described from a single female in his own collection, and Walker's type of *B. benigialis* is also a female. Zeller's type of *B. laciniosa* was a full-marked dark male.

Bomolocha bijugalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 32, *Hypena*.

1870. Robinson, Ann. Lye. Nat. Hist., N. Y., IX, 311, *Hypena*.

1872. Grote, Trans. Am. Entomological Soc., IV, 103, *Hypena*.

1873. Grote, Trans. Am. Entomological Soc., IV, 309, pl. 1, fig. 93, *Bomolocha*.

1873. Grote, Canadian Entomologist, V, 226, *Bomolocha*.

pallialis, Zeller.

1872. Zeller, Verh. k. k. Zool.-Bot. Ges., XXII, 466, pl. 11, fig. 9, *Hypena*.

1873. Grote, Canadian Entomologist, V, 226, pr. syn.

fecialis, Grote.

1881. Grote, Canadian Entomologist, XII, 133, *Bomolocha*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 391, pr. syn.

Ground color brown. Head and thorax concolorous, abdomen more fuscous. Primaries with the median space brown, the surrounding and marginal spaces whitish to pale brown, often with a bluish or violet shading. Transverse anterior line transformed into a curved white line from base to the internal vein, along which it is continued to the transverse posterior line, leaving all below this line pale, to join the pale shade beyond the transverse posterior line. Transverse posterior line black, followed by a white line, these lines lost in strongly contrasting specimens; upright or nearly so, with a usually acute, rarely obtuse, outward tooth over the median vein, and sometimes a more or less marked, never strong, sinuation thence to the margin. Subterminal line punctiform, a little sinuate, composed of white scales preceded by blackish, somewhat indefinite spots, and beyond this the wing is again somewhat washed with brown to the margin, darkening to a more or less prominent oblique subapical streak or mark, the apex of the paler portion of the wing. The ordinary spots are variably defined by upright black scales. Secondaries uniform, smoky fuscous. Beneath, somewhat reddish gray, powdery, with a common faint extra median line, within which the primaries are dusky; secondaries with a discal spot.

Expanse of wings, 25 to 30 mm.=1 to 1.20 inches.

HABITAT.—Canada to Florida, to Texas, to Easton, Washington. Canada and New York in June; Texas in July.

This is more widely distributed than the previously named species and varies a little in ground color within the limits of the same sex. Out of over a dozen specimens before me none are males, and I am therefore unable to give the sexual variation. There is a distinct variation, however, from an almost white shading extra medially to a faint violet and even brown tinge, all sorts of intermediate forms occurring. The outward tooth of the transverse posterior line also varies somewhat in prominence and in the acuteness of its tip. It is upon a rather dark specimen with somewhat broad angle and altogether faded, that Mr. Grote based his species *B. fecialis*. In the wing form this species which so nearly resembles *B. baltimoralis* in type of marking is quite different from it. The primaries are broad, the costa quite arched, the outer margin broadly outcurved and only a little oblique; the excavation below the apex barely marked.

Bomolocha scutellaris, Grote.

1873. Grote, Canadian Entomologist, V, 225, *Bomolocha*.

Ground color brown, varying in shade. Head and thorax concolorous, variably marked with gray scales. Abdomen of the same shade as the secondaries, the segments narrowly pale ringed, most evidently so in the males. Primaries in the females with the basal and extra median spaces more or less prominently white marked; in the male only a little paler than the median space, which itself is not so dark; the subterminal space more or less whitish powdered. Transverse

anterior line white with an outward black edging, a little outcurved on the costa, strongly outwardly oblique to the internal vein and then inwardly to the hind margin. Below the median vein the basal space is paler and more white powdered than in the costal region, and below the internal vein the line is obscure, the pale shade thus invading a little the median space. Transverse posterior line black, outwardly edged with white and followed by a vague yellowish brown line; outwardly oblique, but with an inward curve from the costa to vein five, thus forming an obtuse tooth, and running thence a little oblique and somewhat irregularly sinuate to the inner margin. Subterminal line white, punctiform, preceded by more or less obvious black spots sometimes wanting; preceded also on the costa by a dusky patch, most evident in the paler specimens. Apex usually paler, inferiorly marked by an oblique dark or blackish shade, usually divided into two black spots and occasionally almost wanting, in the latter case the apex being nearly concolorous. A series of terminal lunules, sometimes forming an almost continuous line, preceded by variously obvious pale or white lunate spots. Ordinary spots black, composed of elevated scales—a small dot for the orbicular, an upright line for the reniform. Secondaries varying from pale fuscous gray to dark smoky brown, immaculate except for a broken black terminal line; the fringes cut with yellow. Beneath gray to smoky, powdery, with an extra median line and a discal lunule, which latter is usually obsolete on the primaries.

Expanse of wings, 27 to 32 mm.=1.10 to 1.30 inches.

HABITAT.—Canada to District of Columbia; westward to British Columbia; Central States, Canada and New York in June; District of Columbia in August.

This species differs at once from all those previously described by the complete transverse anterior line; but this is yet very oblique and especially in the female tends to become lost on the internal vein, and when the pale shade partially invades the median space below this vein the resemblance to *B. bijugalis* becomes marked. The sexual difference in this species is strongly emphasized, the male being much darker, sometimes almost uniform in tint throughout, much more robust, and with much looser, coarser, and longer thoracic clothing. The breast is wooly, the vestiture thin but dense, loose, and divergent, forming an incomplete tufting at the base of the abdomen. It is possible that with fresh specimens at hand we may find at this point a secondary sexual structure; but my material is neither sufficient in amount nor satisfactory in quality to enable me to make out with certainty what I can only suspect. In wing form the species is somewhat intermediate between *B. baltimoralis* and *B. bijugalis*. The costa is scarcely arched, the apex is pointed, the outer margin even, oblique, a little rounded only. In the male the primaries are wider than in the female.

The species seems not rare in the northern and northwestern part of its range.

Bomolocha abalinealis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 31, *Hyppena*.

1872. Grote, Trans. Am. Entomological Soc., IV., 102, *Hyppena*.

1873. Grote, Canadian Entomologist, V, 226, *Bomolocha*.

1891. Dyar, Canadian Entomologist, XXIII, 157, larva.

Ground color a rich dark brown, varying to smoky. Head and thorax concolorous. Abdomen fuscous; the edges of the segments feebly pale ringed. Primaries quite even in color, the prominent white lines relieving the uniformity. Transverse anterior line even, slender, white, with two outward angulations. A white line from base to the transverse anterior line at its middle, below which the basal space is white powdered. In the male this is all obscure, and sometimes quite lost. Transverse posterior line double, white, the intervening space quite broad and of the ground color, in course a little irregular, but with a great central outcurve or bulging, much widening the median space. Subterminal line white, inwardly oblique until it reaches near the transverse posterior line, with which it runs rather closely parallel for the remainder of its course and with the outer line of which it is connected by white lines on the veins, cutting the subterminal space into brown spots, the largest of which are on the costa and internal margins. Apex pale, often white, inferiorly marked by a more or less evident brown or black oblique shade, below which the terminal space is often more or less white, gray, or bluish marked. A series of brown terminal lunules, beyond which is a pale line at the base of the fringes, which latter are cut with yellowish. Ordinary spots black, small, marked by raised scales, as usual. Secondaries uniformly fuscous or smoky, with a darker terminal line. Fringes with a yellow line at base, a blackish interline, and whitish tipped. Beneath reddish-gray, powdery, with a common outer line within which the primaries are darker; secondaries with a discal lunule.

Expanse of wings, 25 to 32 mm.=1 to 1.30 inches.

HABITAT.—Canada to Middle and Central States, June to August.

This is an easily recognized species. The contrasting narrow white line, the transverse posterior so strongly curved, and the cutting of the subterminal space are characteristic of the species. The male is much the larger and more robust, the difference in all respects quite as marked as in *B. scutellaris*; but there is less difference in the ornamentation. While the male is darker and more sordid as a whole, the white rather dirty, yet there is no greater difference or lack of contrast. The wing form is most like that of *B. manalis*, the female rather broader and more obtuse, the male with somewhat more pointed apices and more oblique outer margin of primaries. The species is not a rare one and is even locally common.

Bomolocha deceptalis, Walker.1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 30, *Hypena*.1872. Grote, Trans. Am. Entomological Soc., IV, 104, *Hypena*.1874. Grote, Bull. Buff. Soc. Nat. Sci., II, 51, *Macrhyphenia*.
perangulalis, Harvey.1875. Harvey, Bull. Buff. Soc. Nat. Sci., II, 283, *Bomolocha*.1893. Smith, Bull. U. S. Nat. Mus., 44, 393 = *B. damnosalis*.

1893. Butler, Entomologist, XXVI, 312, pr. syn.

Ground color brown: In the female a rather bright reddish gray brown; in the male a very dark smoky fuscous brown. Head and thorax concolorous with the primaries, abdomen with the secondaries. Primaries in both sexes a little paler powdered in the basal space and again beyond the transverse posterior line: but while in the female this powdering is quite dense and makes a light bluish gray shade, in the male it is sparse and appears as a thin bluish wash over the fuscous or smoky brown base. Transverse anterior line even, pale, yellowish, with brown defining lines, a little outwardly bent on the costa, straight or a little oblique below, again inwardly bent on the internal vein. Transverse posterior line even, pale, gray or whitish, preceded by a brown shade line, almost rigid, a little oblique and a very little outwardly bent on the median vein, this angle sometimes disappearing completely. Subterminal line pale, sinuate, rarely continuous, preceded by black spots, which occasionally form a subcontinuous shading. Apex pale, below which there is usually an oblique shade, never prominent, and often hardly distinguishable from the remainder of the terminal space in which the ground color prevails, though more or less modified or lightened by white and bluish scales. A continuous brown terminal line, followed by a yellow line at the base of the fringes. Ordinary spots small, marked by upright black scales as usual, scarcely prominent. Secondaries grayish fuscous in the female, smoky or blackish in the male, immaculate except for a brown terminal line, which is followed by a yellow line at the base of fringes. Beneath, gray in the female, smoky fuscous in the male, immaculate, save that the subterminal line of the primaries is incompletely reproduced.

Expanse of wings, 30 to 35 mm. = 1.20 to 1.40 inches.

HABITAT.—Canada to Virginia, to Central States; New York in July.

This is a common species and readily recognizable in both sexes by the very even, pale median lines, the outer nearly rigid or with only a feeble angulation on the median vein. Dr. Harvey has compared the species to *Parallelia bistriaria* in appearance, and the comparison is not a bad one for the male, which is very much more robust and darker than the female, becoming almost blackish in some cases. The slighter body and paler colors make the primaries of the female seem more frail, and this is emphasized by the somewhat depressed costa in the male.

In my catalogue I had referred *B. perangularis* to *B. damnosalis*, Walker, and suggested their identity with *B. deceptalis*, without recognizing the fact that the differences were sexual. Mr. Butler afterwards disputed my references to *B. damnosalis*, and judging from Walker's description he is correct. He also suggested the sexual relation of *B. perangularis* to *B. deceptalis*, and in this also he is right. In the British Museum the specimens were mixed, and I must have taken as type specimen of Walker's *B. damnosalis* one not entitled to rank as such. I can not explain my error in any other way.

***Bomolocha madefactalis*, Guenée.**

- 1854. Guenée, Species General, Deltoïdes, 35, *Hyppena*.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XV, 33, *Hyppena*.
- 1872. Grote, Trans. Am. Entomological Soc., IV, 103, *Hyppena*.
- 1873. Grote, Canadian Entomologist, V, 226, *Bomolocha*.
achatinalis, Zeller.
- 1872. Zeller, Verh., k. k. Zool. Bot. Ges., XXII, 468, Pl. II, fig. 7, *Hyppena*.
- 1873. Grote, Canadian Entomologist, V, 296, pr. syn.
- 1882. Grote, in Check List; a distinct species.
damnosalis, Walker.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 35, *Hyppena*.
- 1893. Smith, Bull. U. S. Nat. Mus., 44, 393, *Bomolocha*.
caducalis, Walker.
- 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 35, *Hyppena*.
profecta, Grote.
- 1872. Grote, Trans. Am. Entomological Soc., IV, 194, *Hyppena*.
- 1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 30, *Maerhyppena*.
- 1893. Smith, Bull. U. S. Nat. Mus., 44, 393, = *caducalis*.

Ground color deep chestnut brown, varying to smoky or blackish in the male. Head and thorax concolorous with the paler shade of the primaries; abdomen like secondaries. Primaries with the space beyond the transverse posterior line bluish gray or violet in the female, very feebly violet tinged only in the male. Transverse anterior line feebly marked, single, outwardly oblique, with two outcurves, that below the median vein best marked; often entirely obsolete in the male, more rarely in the female. Transverse posterior line slender, pale, principally defined by the difference in shade between the median and subterminal spaces, its course upright, or nearly so as a whole, with a little outward angulation over the median vein, and another in the submedian interspace. Subterminal line pale, vague, broken, sinuate, sometimes marked by dark preceding black dots, but more usually by a vague indefinite shade. Apex more or less pale marked, below which is an oblique darker shade more or less obvious, but never prominent and sometimes entirely wanting. A series of small terminal dots which are often wanting, or in the male not visible. Through the outer portion of the median space it darkens somewhat to the transverse posterior line, forming a sort of median shade-band. Ordinary spots indicated by black scales as usual. Secondaries fuscous gray brown

to smoky black; in the female often with a vague discal lunule, in the male immaculate. Beneath, ashen to smoky, with a more or less marked outer line and discal lunule on all wings.

Expanse of wings, 24 to 32 mm. = 0.95 to 1.30 inches.

HABITAT.—Canada to Texas; Central States; South Dakota; Delaware in June.

Of the specimens before me from the United States National Museum, one is marked No. 2844, Sept. 9th, '82, and this is an undersized female, expanding 24 mm., or less than an inch. Few specimens expand less than 28 mm., and 30 mm. is about a fair average expanse. This explanation is made in view of the fact that *B. sordidula* resembles this species in the female so nearly that errors are possible, and size is an important factor in distinction. A second specimen from the National Museum is marked "Larva on Walnut, pupated Aug. 12, '83. Issued April 16, '84." This specimen is a full-sized male. The sexual differences in this species are strongly marked, the dark, robust, broad-winged male bearing little resemblance to the lighter, more frail female. To Mr. Butler belongs the credit of pointing out this relationship, which had not been theretofore suspected. We have in the male, which is best known as *Hypena profecta*, the most robust of our species and the broadest winged. It is a common species locally.

Bomolocha sordidula, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 103, *Hypena*.

1876. Grote, Check List Noctuidæ, 45, *Bomolocha* & *Euhypena*.

"Male.—Size and color and form of *H. torcuta*. Sooty black, powdered with gray scales. The ordinary lines are faintly apparent, nearly perpendicular, brought into relief by pale powderings, waved or undulate. Transverse posterior line usually marked by pale scales on costa. Several anteapical minute pale costal dots. Fringes interrupted with whitish on both wings, short. Secondaries deep blackish, with discal dots apparent. Beneath paler, dusted with pale scales, without markings, except terminal lines as on upper surface, and discal marks."

The above original characterization applies fairly well, and it need only be added that while some specimens become almost immaculate, with a bronze glistening reflection, others have the transverse posterior line traceable, and in such cases it is as in the female, which has not been described.

Female.—Ground color, dirty luteous brown. Head and thorax concolorous, abdomen pale luteo-fuscons like secondaries. Primaries with the median space a little darker, a bluish gray shade following the transverse posterior line and lost before reaching the subterminal line; terminal space sometimes a little paler. Transverse anterior line quite remote from base, enlarging the basal space, which is sometimes a little lighter in shade; brown, single, feebly marked, with two distinct outcurves. Transverse posterior line pale, inwardly margined by a

darker shade line which is also inwardly diffuse and darkens the outer portion of the median space; as a whole nearly upright, with well marked outward bends on the median vein and in the submedian interspace. Subterminal line pale, sinuate, of the usual form, continuous or nearly so, sometimes marked by a darker preceding shade; but in none of my specimens by blackish spots. Apex pale, limited inferiorly by an oblique shade which is scarcely darker than the ground. A series of dusky terminal lunules, which are sometimes preceded by a paler shading. The ordinary spots are barely indicated in my specimens by a few black, raised scales. Secondaries uniformly fuscous. Beneath paler, powdery, nearly immaculate, or with a more or less defined discal spot.

Expanse of wings, 24 to 27 mm. = 0.95 to 1.08 inches.

HABITAT.—New York to Texas.

A specimen in the National Museum, from the Riley collection, is marked "Larva on Alder, 21, 7, 84."

The almost immaculate male would hardly be associated with the female at first sight, and as a matter of fact the females are either marked *B. achatalis* or *B. madefactalis* in collections, none of them having been correctly associated with the opposite sex.

The resemblance to the female *B. madefactalis* is sufficiently marked to justify placing it as a small, somewhat faded specimen, and the differences are really only comparative. The size is smaller, 25 mm. being the average, the body seems more than proportionately sligher, and the costa seems a little more arched, the outer margin more rounded. In color it lacks all bright or rich shadings and has a dirty luteous tint, while the bright violet or gray tints of the former species are replaced by a sordid gray with a faint bluish tinging, and this even is much reduced or almost wanting. The transverse posterior line is decidedly more angulated, and the subterminal line is more distinct and more continuous. With a fairly good series at hand there should be no difficulty in distinguishing the species; but isolated specimens may in some instances be doubtful.

The species seems less abundant than its ally. The type is in the Philadelphia collection, a fact I was not certain of in my catalogue.

Bomolocha umbralis, Smith.

1884. Smith, Bull. Bkln. Entomological Soc., VII, 4, *Bomolocha*.

Ground color dark chocolate brown. Head and thorax concolorous; abdomen smoky or blackish, like the secondaries. Primaries with no strong contrasts, a bluish powdering between the median shade and transverse posterior line, feebly relieving an otherwise almost uniform shading. Transverse anterior line a somewhat richer brown, single, broad, but not contrasting, with two outcurves. A little beyond the middle of the wing is a rigid, upright pale line, preceded by a richer brown shading, beyond which the space is feebly blue powdered to the

transverse posterior line. The latter is somewhat diffuse, its edges irregular, but its course very even and nearly parallel with the outer margin. Subterminal line fragmentary, marked by vague paler or yellowish scales. Apex not paler. A series of brown or blackish terminal lunules. The ordinary spots are very feebly marked by upright black scales. Secondaries a uniform dark, smoky brown, with a faint admixture of carmine. Beneath, uniform blackish brown, without markings.

Expanse of wings, 27 mm.=1.10 inches.

HABITAT.—Florida.

This species is entirely unlike all our others, and resembles a West Indian type. I would not now describe the species as of our fauna without more evidence as to its range, but retain it here since it has been described; it will probably find more congenial allies when the West Indian species are fully studied. As compared with the other species, it has the pointed primaries with the oblique outer margins of *B. baltimoralis*, but the wings are shorter and broader. It differs from all others of our species, save *B. toreuta*, by the want of a paler apical space, and from all by the peculiar upright median pale line, which at first appears like the transverse posterior line.

The specimen now before me is a male and resembles the type which is in the United States National Museum.

Bomolocha toreuta, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 24, *Hypena*.

1873. Grote, Bull. Buff. Soc. Nat. Sci., 1, 38, *Euhypena*,
internalis, || Robinson.

1870. Robinson, Ann. Lyc. Nat. Hist., N. Y., IX, 311, *Hypena*.

1892. Grote, Trans. Am. Entomological Soc., IV, 24, pr. syn.
albisignalis, Zeller.

1872. Zeller, Verh. k. k. Zool. Bot. Ges., XXII, 463, *Hypena*.

1875. Grote, Check List Noctuidæ, 45, pr. syn.

Ground color sooty or smoky brown. Head and thorax concolorous; abdomen a little paler. Primaries with no color contrasts, the median lines obscured, marked by white scales. Transverse anterior line marked only by white scales on the costa and internal margin and more rarely, also, on the veins—sometimes quite obsolete. Transverse posterior line traceable for most of its sinuate course by white scales, usually distinct as a white line at its costal inception, and followed on the inner margin below vein 1, by a white blotch, which extends nearly to the subterminal line; broken, narrow, sinuate, sometimes nearly obsolete and rarely subcontinuous. A series of black, preceded by white, terminal dots. Ordinary spots small, marked by raised black scales. Secondaries, smoky fuscous, immaculate. Beneath, a rather pale, powdery gray; in the female with a reddish tinge, with a variably marked extra median line and a discal lunule.

Expanse of wings, 25 to 29 mm.=1 to 1.15 inches.

HABITAT.—New York to Texas, to Kansas; July.

This species does not seem to be taken by the Albany collectors, but I have a specimen from Newburg, nearly half way up the Hudson. It seems more common southwardly and is fairly well represented in collections.

The species is so simply marked that it seems as if mistake was impossible. The white blotch on the internal margin is quite unique in the genus as represented in our fauna. There is no difference in maculation between the sexes, and the difference in size is not greatly marked. The male is more heavily built, however, and the vestiture is more shaggy above and more woolly beneath.

Bomolocha edictalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 28 *Hypena*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 393, *Bomolocha*.

♀ *vellifera*, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 87, pl. 11, fig. 7, *Meghyppena*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 393, pr. syn.

♂ *lentiginosa*, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 87, *Meghyppena*.

Ground color brown, varying somewhat in shade from a violaceous gray to light chocolate brown. Head and thorax concolorous, abdomen a little paler. Primaries with the markings quite sharply defined, mottled by numerous brown or blackish strigæ, which are transverse, short, and rivulous, not connected to form continuous lines. Transverse anterior line yellowish, more or less evident and more or less marked outwardly by a black line or shade, making one large outward bend in the submedian interspace. Transverse posterior line yellowish, preceded by a brown or black shade line, upright to the median vein, thence with a little incurve, obliquely to the inner margin, forming thus an obtuse angulation on the median vein. Subterminal line pale, undefined, marked by white scales, sometimes also by blackish spots; but more usually by a dusky preceding shade. In course it is sinuate, with a prominent medial outcurve. A series of more or less marked brown terminal lunules. Fringes a little waved or scalloped. Apex usually paler, inferiorly margined by a dark-brown oblique shade, which merges into the ground color. Ordinary spots well marked, black. Orbicular small, round; reniform lunate or kidney-shaped. In the submedian interspace there is a distinct tendency toward a darker shade to connect the median lines, which here approach each other closely. Secondaries varying from fuscous gray to nearly blackish, the fringes paler; sometimes with a faint discal lunule, and more rarely with traces of transverse strigæ similar to those on the primaries. Beneath, varying from luteous gray to smoky, with brown transverse strigæ more or less distinct and most obvious on secondaries; a more or less marked outer line and a discal lunule, usually obsolete on primaries and prominent on the secondaries. On the secondaries there is often a broad, darker margin, and this is sometimes indicated on the primaries.

Expanse of wings, 30 to 39 mm. = 1.20 to 1.55 inches.

HABITAT.—Canada; New York in July; Northern and Eastern States.

This is the largest of our species in expanse of wings, though not so robust as male *B. madefactalis*, and seems to be confined to a northern range, none of my specimens being from any locality much south of Albany, while it seems to be scarcely common anywhere. Mr. Grote, in stating the differences between his *B. lentiginosa* and *B. cellifera*, very fully detailed the differences between the sexes, for such is the relation these species bear to each other. The male (*lentiginosa*) is larger, somewhat more robust, and the colors are dull, the contrast little marked.

The species is peculiar by the rivulous, brown, transverse strigæ, and by the long, straight palpi, which scarcely differ in the sexes. The apices of the primaries are more than usually pointed, and the outer margin is unusually excavated below that point. In all these characters, but especially in the first mentioned, the species is like *Hypera* rather than *Bomolocha*, and is an intermediate type. If others are found fully agreeing with it Mr. Grote's genus *Meghypera* may again come to be used.

Bomolocha citata, Grote.

1872. Grote, Trans. Am. Entomological Soc., IV, 101, *Hypera*.

1876. Grote, Check List Noctuidæ, 45, *Bomolocha*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 392, = *Hypera idrusalis*.

1894. Butler, Entomologist, XXVII, 50, an sp. dist.

trituberalis, Zeller.

1872. Zeller, Verh., k. k. Zool. Bot. Ges., XXII, pl. II, fig. 6, *Hypera*.

1882. Grote, New List Lepidoptera, 44, pr. syn.

Ground color rather pale chocolate brown, varying in shade. Head and thorax concolorous. Abdomen more fuscous or smoky; concolorous with the secondaries. Primaries with a somewhat oblique, irregular patch in the median space darker brown, and an oblique shade from apex extending inward to the transverse posterior line at about the median vein. Basal space the lightest portion of the wing. Transverse anterior line brown, slender, not prominent, forming a long outward angle in the submedian interspace. An oblique line of raised black scales runs nearly parallel and only a little within this line, so far as it extends outwardly, but continues in the same course to the internal vein, where it joins the pale, prominent line. Between this black line and the median line the dark central portion of the wing is bounded. Median line pale, dark margined inwardly, outwardly oblique to vein 3, with a small angle on the cell, then inwardly oblique, with little incurves in the interspaces. Beyond this line a bluish-gray shade suffuses the space to the subterminal line, cut only by the oblique dark shade from below apex. Transverse posterior line dusky, followed by a paler shade line, even or feebly lunulated, somewhat dilated on the costa, in general

course with a very even or not great outcurve. This line is often obscure, and the pale line is accepted as the true transverse posterior line: which it is not. Subterminal line whitish, denticulate, a little marked by preceding black scales; sometimes interrupted. Three white costal dots before the apex, which is whitish or gray. An interrupted black terminal line, preceded by a white line. Fringes usually long, brown at base, with a black interline; smoky at tip. The ordinary spots are composed of small patches of elevated scales. Secondaries fuscous to smoky or blackish, immaculate. Beneath gray to smoky, immaculate except for a blackish terminal line and a white anteapical costal blotch on primaries, which is frequently absent.

Expanse of wings, 17.5 to 19 mm. = 0.70 to 0.76 inch.

HABITAT.—New York to Texas; Florida; Illinois in August and October; Texas in July.

A specimen from the United States National Museum is marked "No. 2584, on *Urena labiata*; Iss. March 29, 1882."

This little species is not common in collections, though probably not rare in nature.

Its synonymy, unfortunately, is scarcely settled. In my studies in the British Museum I found a specimen which I took as the type of *Hyppena idausalis*, Walker, and which I considered the same as *H. citata*, Grote, and so referred it in my catalogue. Mr. Butler writes, later, that this is a mistake, and that Walker's species is not even a *Hyppena*. The description somewhat bears out Mr. Butler's statement, and I have apparently made some mistake, though how I can not conceive. I can hardly believe that I would have failed to recognize this species, however poor. On the other hand, Mr. Butler suggests that Mr. Grote's species is Guenée's *Hyppena eroletalis*, from Brazil (Gn. Delt., 29). The description is fairly applicable except as to size, Guenée giving 25 mm. for the female, while no specimens I have ever seen exceeded 19 mm. Yet Mr. Butler may prove to be right when sufficient material is at hand.

The species is the smallest in our fauna, in ludicrous contrast to the only other species with long, straight palpi. The oblique line of elevated scales and the false, pale, transverse posterior line are characteristic features, and distinguish the species. The male is a little more robust than the female, but I have noted no other differences.

Bomolocha annulalis, Grote.

1876. Grote, Check List Noctuidæ, 45, *Bomolocha*.

"This brown and light purple Texan species differs by the sagittate, pale, subterminal line becoming white at apices, and followed by dark marks. A fine white line bordering inwardly the dark line on the terminal margin. A dark diffuse shade from the disk crossing the subterminal line and extending upwardly to apex. Transverse anterior line dentate; transverse posterior line continuous and nearly even. Beneath the apical pale dots are prominent. Belfrage No. 213, expanse 26 mm."

The type in the British Museum represents a species I had not previously seen, and is not represented in any collection before me.

Mr. Grote places it between *B. abalinalis* and *B. achatinalis* (*maefactalis*).

Genus **LOMANALTES**, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 13.

Head distinct, even somewhat prominent. Eyes large, naked, globose, prominent. Front quite narrow, with a pointed interantennal tuft. Ocelli distinct, situated halfway between the base of the antennae and the posterior limit of the head. Palpi long, straight in the female, a little oblique in the male, equaling in length the head and thorax combined in the former, and only a little shorter in the latter. Antennae simple in both sexes, males with small lateral ciliations. Thorax small, abdomen slight, cylindrical, more conic in the male, equaling or slightly exceeding the anal angle of the secondaries, with small truncate dorsal tufts. Legs long, moderately stout, closely scaled in both sexes, without special modification in the male. Primaries pointed, the apex acute, outer margin very oblique and only a little curved, costa a little depressed centrally.

This genus is very doubtfully distinct from *Bomolocha*, differing really only in the wing form. The palpal character relied on by Mr. Grote is not only variable in the specimens, but is actually paralleled in *Bomolocha*. Yet the insect does convey a somewhat distinctive impression, and I have therefore retained the genus, the more readily as it seems to be somewhat intermediate between *Bomolocha* and *Hypena*. The single species has essentially the markings of *B. deceptalis*.

Lomanaltes eductalis, Walker.

1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 36, *Hypena*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 390, *Lomanaltes*.

latulus, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 14, pl. 1, figs. 12, 13, *Lomanaltes*.

1893. Smith, Bull. U. S. Nat. Mus., 44, 390, pr. syn.

Ground color a pearly gray, with a more or less marked brown suffusion, deepest and most marked in the male. Head and thorax concolorous. Abdomen paler, fuscous gray or yellowish, the edges of the segments narrowly pale marked. Primaries with the space beyond the transverse posterior line more or less bluish gray, interrupted by a dark shade preceding the subterminal line and another which extends along the outer margin, leaving a pale apical space. Transverse anterior line rusty yellow, the edges a little darker, nearly upright, but making a somewhat abrupt outward bend on the internal vein. Transverse posterior line yellowish, with a rusty internal edging and a following dusky shade line which is often obsolete; in course it is very even, inwardly oblique, with a small, obtuse outward bend on the median vein, which is sometimes almost obsolete. Subterminal line pale, marked by a preceding dusky shade, somewhat outcurved in the central part of its

course. Occasionally black scales, more or less massed into loose spots, also precede the line and further define it. The terminal space darkens beyond this line to the margin, but leaves the apical portion free and pale. A brown terminal line followed by a yellowish line at the base of the fringes. The ordinary spots small and marked by elevated black scales. Secondaries yellowish fuscous to blackish, immaculate or with a lunate spot, usually with a well-marked dark terminal line. Beneath, fuscous to blackish, with a more or less marked extra median line and discal spot, both of which are sometimes obsolete.

Expanse of wings, 21 to 26 mm. = 0.85 to 1.05 inches.

HABITAT.—Nova Scotia to Virginia; Minnesota; Central States; New York in May.

A specimen from the National Museum, collection C. V. Riley, is marked "May 6, '84, on Alder."

This little species does not seem to be common, but is easily recognized by the very even median lines closely resembling in course those of *Bomolocha deceptalis*, and by the pointed fore wings.

There is little variation except in the shade of brown over the gray base and the consequent contrast of color. The male is darker and more even in tint as a rule, the bluish shade dull and obscure.

Genus *PLATHYPENA*, Grote.

1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 38.

Head moderate in size, front very narrow, with a pointed tuft. Eyes large, prominent, globose, naked. Ocelli distinct, situated close to the compound eye and midway between the base of the antennae and the posterior angle of the eye. Tongue moderate. Palpi moderate in length, decidedly shorter and a little oblique in the male; longer and straight in the female; the terminal joint very short and obtuse in both sexes. Antennae long, extending beyond apical third of primaries; simple in both sexes, the male finely ciliated only; inserted well forward, almost on the front. Body moderate in the female, robust in the male, the thoracic vestiture scaly, a little loose in both sexes, perhaps a little more prominently so in the male. Abdomen conic, cylindrical, extending to the anal angle of the secondaries, quite prominently tufted on the dorsum. Legs quite robust, moderate in length, the spurs of the middle and hind tibiae not excessively long. Under side of body somewhat woolly in the male. Wings large as a whole. Primaries narrow, apices rectangular or a little acute, outer margin moderately rounded, oblique; inner margin sinuate, the hind angle prominent, a little produced, more so in the male. Secondaries broad, outer margin quite evidently excavated below the apex in the female, almost even in the male.

This genus differs from *Hyppena* in the more robust structure, the difference in bulk between the sexes—the male being larger, more robust and broader winged—in the short palpi and in the sinuate inner

margin of primaries, which is incurved before and makes prominent the hind angle.

From *Bomolocha* the genus differs in the form of the primaries and in the proportionately broad secondaries. It is thus intermediate in many characters between *Bomolocha* and *Hyppena*, while it possesses combinations peculiar to itself and sufficient to authorize it as valid.

Plathypena scabra, Fabricius.

1794. Fabricius, Entomologia Systematica, Suppl., IV, 448, *Hyblaea*.
 1851. Guenée, Species General, Deltoides, 40, *Hyppena*.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 34, *Hyppena*.
 1872. Grote, Trans. Am. Entomological Soc., IV, 102, *Hyppena*.
 1873. Lintner, Canadian Entomologist, V, 81, *Hyppena*.
 1873. Grote, Bull. Buff. Soc. Nat. Sci., I, 38, *Plathypena*.
 1880. Riley, American Entomologist, III, 8, *Hyppena*.
 1880. Coquillett, Canadian Entomologist, XII, 43, larva.
 1881. Coquillett, Canadian Entomologist, XIII, 137, larva.
erectalis, Guenée.
 1854. Guenée, Species General, Deltoides, 40, *Hyppena*.
 1859. Walker, Cat. Brit. Mus., Heterocera, 35, ? an var. pr.
 1872. Grote, Trans. Am. Entomological Soc., IV, 102, *Hyppena*.
 1873. Lintner, Canadian Entomologist, V, 81, = ♀ *scabra*.
palpalis, Haworth.
 1812. Haworth, Lepidoptera Britannica, 361, *Crambus*.
 1829. Stephens, Illustrations British Entomology, Haust., IV, 12, *Hyppena*.
 1854. Guenée, Species General, Deltoides, 40, pr. syn.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 34, pr. syn.
crassatus, Haworth.
 1812. Haworth, Lepidoptera Britannica, 336, *Crambus*.
 1854. Guenée, Species General, Deltoides, 40, ? = *H. erectalis*.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 35, = *H. erectalis*.
obesalis, Stephens.
 1829. Stephens, Illustrations British Entomology, Haust., IV, 11, *Hyppena*.
 1859. Walker, Cat. Brit. Mus., Heterocera, XVI, 35, = *erectalis*.
subrufalis, Grote.
 1872. Grote, Trans. Am. Entomological Soc., IV, 102, var. *erectalis*.
 1893. Smith, Bull. U. S. Nat. Mus., 44, 395, pr. syn.

Ground color a dark purplish or smoky brown. Head and thorax concolorous. Abdomen more smoky, like the secondaries. Primaries dusky to the transverse posterior line, then with bluish powderings, which scarcely relieve the somber tint in the male, but are quite contrasting in the female. In the latter sex the inferior half of the median space often becomes shaded with yellowish red-brown, sometimes quite contrastingly. Transverse anterior line red-brown, preceded by pale in the best marked specimens, outwardly bent, with three long outward angulations, rarely complete, and in the male quite frequently entirely obsolete. Transverse posterior line black or brown, outwardly bent over the cell and almost rigid beneath. The line is marked through the lower part of its course by elevated scales, which are most prominent on the inner margin. Subterminal line interrupted, pale, preceded by black spots, rather evenly bisinuate, often quite contrasting in the female, and as inconspicuous in the male. A brown terminal line, which is rarely

interrupted, preceded by undefined bluish lunules in the interspaces. In the male the apex is blue powdered, the terminal space else quite even. In the female the apical patch is more contrasting, inferiorly limited by a blackish streak, the terminal space being irregularly and variably mottled with bluish brown and black. Opposite the hind angle is a longitudinal black mark, which crosses the subterminal line. Usually a narrow black line connects the median lines in the submedian interspace, and another connects the ordinary spots, which are much reduced and marked by black elevated scales. The basal space is also sometimes blue powdered or inferiorly brown. In the male the ordinary spots are sometimes hardly evident. Secondaries deep smoky-brown, varying a little in tinge toward brown or black. Beneath, uniformly brown or blackish; the secondaries with a more or less evident discal spot.

Expanse of wings, 27 to 34 mm.=1.10 to 1.35 inches.

HABITAT.—Nova Scotia to Texas; east of the Rocky Mountains. June to October.

This is our most abundant species, and in some respects a most variable one. When the sexes are separated, however, the range of variation in each is much reduced, and is usually a difference in the amount of contrast, rather than in actual maculation. The species is easily recognized by the characters already given. The subterminal line in its course and the elevated scales marking it are characteristic.

Genus HYPENA, Schrank.

1802. Schrank, *Fauna Boica*, II, 2, 163.

1854. Guenée, *Species General*, *Deltoides*, 25.

1857. Lederer, *Noctuiden Europas*, 214.

1859. Walker, *Cat. Brit. Mus.*, Lep. *Heterocera*, XVI, 22.

Head moderate in size or small, front narrow, with an unusually long interantennal tuft, sometimes exceeding the head by its own length. Eyes prominent, globose, naked. Ocelli distinct, situated close to the compound eye, at about the middle of the vertex. Palpi long or very long, sometimes exceeding the head by more than the length of the head and thorax combined, similar in the sexes, directed straight forward, greatly compressed, the upright vestiture unusually long, even on the terminal joint. The second joint in some of the species is a little arquate, the concavity inferior. Antennae simple in the female, slightly ciliated in the male. Body slight; thorax small; abdomen reaching to or exceeding the anal angle of the secondaries, with quite a prominent dorsal tuft at base, and smaller tuftings on 3 or 4 other segments. Legs long and slender, closely scaled, not specially modified, the usual tibial spurs long and unequal. Wings large, primaries long and narrow, the apices pointed, outer margin oblique or obtusely produced at the middle, a little excavated below the apex. Secondaries proportionately very large and broad, the outer margin a little excavated below the apex. There is no difference in essential structure between the

sexes, save that the male has the primaries distinctly broader and is always much more evenly colored, without contrasting lines or shades.

The genus is an easily distinguished one in our fauna. The only other narrow winged genus we have is *Plathypena*, and in that the palpi are decidedly shorter, oblique in the male, while the latter sex is also very much more robust and has woolly clothing beneath. Finally the wings have the inner margin sinuate and the anal angle marked or a little produced, while in *Hypena* the margin is even and the angle obtuse, or at least not at all prominent.

All the species are marked by tufts of elevated scales indicating the ordinary spots and by an additional little patch below the median vein and at about the middle of the median space.

As thus restricted we have four species of *Hypena*, one of them new.

At the head I place *H. humuli*, an old friend, which differs from all the others by the even outer margin of the primaries, no trace of any angulation occurring in any specimen. The species is further distinguished by having a sinuate transverse posterior line, distinctly outcurved over the reniform. In this it agrees with *Plathypena scabra*, but differs from all its congeners.

The transverse posterior line, by the bye, furnishes an exceedingly useful and reliable character for the recognition of species in this genus, being absolutely constant, always distinct in the female, and usually also in the male.

H. modesta is a new species, which has been probably confused with *H. californica*. It is of a quiet color, powdery, in the male almost a uniform pearl gray, in the female a little more reddish, with better defined markings, the subterminal space with a markedly blue-gray tinge, which can scarcely be called contrasting. The transverse posterior line is rigidly oblique, without curve, bend, or angulation to the submedian interspace, where it is inwardly bent, forming a tooth on the internal vein.

H. californica is decidedly larger, always reddish or darker brown, in the female with sharp contrasts against the yellow base, the pale colors all yellowish and never bluish. The transverse posterior line, while much the same as that of *H. modesta* as a whole, is irregular, a little denticulated on the veins and curved in the interspaces; while the inward tooth on the internal vein is much deeper and more acute as a rule, to which, however, there are frequent exceptions. *H. decorata* nearly or quite equals *H. californica* in size, but is of a yet richer and deeper brown, with little admixture of yellow, and the subterminal space shot with bluish; the contrasts in the female being bright if not strong. The transverse posterior line is even, a very little sinuated to the submedian interspace where it forms an outward tooth, followed by one of equal length inwardly on the internal vein. It thus differs from both those previously mentioned by the outward tooth above the inward one.

The three species last named, which are from the Pacific Coast or the Northwest, may be further distinguished in that *H. decorata* has the palpi distinctly shorter than in the two others, resembling *H. humuli* in that respect and in the less marked angulation of the outer margin, which in the male is very slight. *H. californica* and *H. modesta* have excessively long palpi, proportionately longest in the latter, while the outer margin is more angulated; also most obviously in *H. modesta* and particularly in the male.

We can follow the modifications of the transverse posterior line in much the same way. *H. humuli* has it irregularly sinuate and bent, with an outcurve in the submedian interspace and an inward tooth on the internal vein. *H. decorata* has the line nearly rigid, only a little sinuated, has the outcurve in the interspace less marked, but the inward angle distinct. *H. californica* has the line more rigid, but with small denticulations on the veins; the outcurve in the interspace has disappeared, while the inward angle is acute and well marked. Finally, *H. modesta* has the line absolutely rigid and even to the inward angulation on vein 1.

ANALYSIS OF THE SPECIES OF HYPENA.

Outer margin not angulated at middle HUMULI.
Outer margin more or less outwardly bent at middle.

Palpi not excessively long; transverse posterior line with an outward bend in the submedian interspace..... DECORATA.

Palpi excessively long; transverse posterior line without an outward bend or curve in the submedian interspace.

Base of ground color yellow; subterminal space yellow; size larger,
CALIFORNICA.

Base of ground color gray; subterminal space bluish gray; size smaller,
MODESTA.

Hypena humuli, Harris.

1835. Harris, Catalogue Insects Massachusetts, 74, *Crambus*.
1841. Harris, Rept. Insects Massachusetts, 345, *Hypena*.
1855. Fitch, Trans. N. Y. State Agl. Soc. XV, 555, pl. 1, fig. 1, *Hypena*.
1856. Fitch 1st and 2nd Rept. Insects N. Y., 323, pl. 1, fig. 1, *Hypena*.
1862. Harris, Injurious Insects, Flint ed., 477, fig. 237, *Hypena*.
1872. Grote, Trans. Am. Entomological Soc., IV, 101, *Hypena*.
1878. Lintner, Entomological Contributions, IV, 128, *Hypena*.
evanidalis, Robinson.
1870. Robinson, Ann. Lye. Nat. Hist., N. Y., IX, 311, *Hypena*.
1872. Grote, Trans. Am. Entomological Soc., IV, 101, *Hypena*.
1872. Grote, Canadian Entomologist, IV, 111, *Hypena*.
1873. Grote, Trans. Am. Entomological Soc., IV, 309, pl. 1, fig. 87, *Hypena*.
1878. Lintner, Entomological Contributions, IV, 128, pr. syn.
germanalis, Walker.
1859. Walker, Cat. Brit. Mus., Heterocera. XVI, 35, *Hypena*.
1874. Grote, Bull. Buff. Soc. Nat. Sci., II, 52, pr. syn.
var. *olivacea*, Grote.
1873. Grote, Canadian Entomologist, V, 226, *Hypena*.
1882. Grote, New List, 44, pr. var.
var. *albopunctata*, Tepper.
1881. Tepper, Bull. Bkln. Entomological Soc., IV, 2, pl. 1, fig. 5, *Hypena*.
1891. Smith, List Lepidoptera, 64, pr. var.

Ground color, a grayish brown, varying in tint; in the male with blackish powderings, in the female more or less suffused with reddish. Body of the ground color; abdomen more gray. Primaries in the male even, without contrast, the lines vaguely traceable in most instances. In the female the upper portion of the median space is darker brown, contrasting with the paler shade elsewhere in the wing. This brown shade usually extends less markedly to the upper part of the basal space, while its outer inferior angle is very near to the termination of a blackish subapical oblique streak. In some specimens of both sexes the wings are transversely strigate, the strigæ brown, rivulous, not continuous, in the females marked only through the darker portions of the wing. Transverse anterior line pale, more or less brown or dark margined, strongly toothed outwardly on the median and submedian veins; rarely distinct, more often entirely obsolete, especially in the male. Transverse posterior line pale or whitish, arising above the reniform and abruptly outcurved over this spot, as a whole nearly upright below it, but with an outward angle in the submedian interspace and an inward tooth on the internal vein. This line is usually more evident in the male. Subterminal line punctiform, consisting of black dots followed by white scales, the line very evenly parallel with the outer margin. The line is best marked in bright females; it tends to lose the white scales in pale specimens, the black dots alone remaining, and tends to lose the black spots in dark specimens in which the white scales only are obvious. In a few somber gray males even this line is lost. A series of dark or black terminal lunules preceded by white scales. Orbicular a little round tuft of upright black scales. Reniform marked by two such spots. Beneath the median vein, about the center of the median space, is another small, round tuft of elevated scales. Secondaries an even gray to fuscous, with a brown or darker terminal line. Beneath, more or less powdery, smoky to reddish, the primaries darker on the disk and usually immaculate, the secondaries paler, usually with a discal dot and a rather well-marked median dusky band.

Expanse of wings, 27.5 to 33 mm. = 1.10 to 1.32 inches.

HABITAT.—Northern United States, from the Atlantic to the Pacific; Canada; British Columbia; southward to Alabama. Colorado in September, October; British Columbia May, July, September, October; Kansas in April; Delaware in August; New York July, September, October.

This is at once the most common and widely distributed species of the genus. Its larvæ feeds on the hop-vine leaf, and probably wherever that plant occurs, there our species will also be found. There is a considerable amount of variation in the ground color, that of the males ranging from an even, sordid reddish brown to almost black. The palest of the forms is *H. olivacea*, Grote, the darkest is *H. albopunctata*, Tepper, the intermediate and typical form is *H. germanalis*, Walker. The female of *H. olivacea* is *H. cranidulis*, Grote. The coloration seems

to depend somewhat upon locality, the palest specimens coming from northern New York, while the darkest forms are confined to the Pacific Coast.

The structural features of the species have been previously referred to and need not be again rehearsed here.

***Hypena decorata*, Smith.**

1884. Smith, Bull. Bkln. Entomological Soc., VII, 4, *Hypena*.

Ground color a rich red brown with bluish gray relieving scales. Head and thorax concolorous, the latter speckled with blue scales in the female. Abdomen like the secondaries. Primaries quite markedly transversely strigate, many of the strigae continued almost entirely across the wing. The subterminal space is quite contrastingly blue gray just beyond the transverse posterior line; but becomes of the brown base before the subterminal line. Transverse anterior line pale, outwardly marked with brown, with an acute outward tooth on the median vein. Transverse posterior line pale, preceded by black, very even, oblique, a little sinuated, with a marked outward bend in the submedian interspace and a well-marked inward tooth on the internal vein. Subterminal line punctiform, the spots black, followed by white scales, as a whole a little sinuate. A lunate blackish terminal line preceded by whitish scales. Beneath the pale apex is a distinct deep brown oblique shade, extending nearly half way through the subterminal space. Orbicular a round patch of elevated black scales. Reniform a lunule of elevated scales. A distinct black line surmounted by a paler shade nearly connecting the two spots. Secondaries yellowish fuscous, even, with a brown terminal line and paler yellow fringes. Beneath, powdery yellowish, the apices brown, both wings with a brown extra-median line; primaries with an incomplete subterminal line, which is white dotted near the costa; secondaries with a discal spot.

Expanse of wings, 31 to 34 mm.=1.25 to 1.35 inches.

HABITAT.—California; Vancouver.

This species was collected by Mr. Hy. Edwards, and I have seen no specimens other than those from which I originally described. Only the female is before me at present, but the male differs only in the more even color of the primaries, the contrasts being less marked. The character of the subterminal line further relates this species with *H. humuli*, while in the very distinctly scalloped fringes the species is unique, differing from all others of our forms. There is little chance of mistaking it.

***Hypena californica*, Behr.**

1870. Behr, Trans. Am. Entomological Soc., III, 23, *Hypena*.

Ground color a somewhat pale yellow, more or less shot with red brown, varying somewhat in shade. Head and thorax concolorous, the latter with the disk often darker. Abdomen concolorous with the secondaries. Primaries with the pale color predominating in the female, the brown markings contrasting. In the male the wing is

usually much darker, gray or smoky in its shadings, without marked contrasts, yet as a rule the markings fairly evident. Through the costal region, and sometimes the other parts of the wings as well, rivulous brown lines or strigæ are visible. Transverse anterior line of the pale ground color, followed by a line of the brown shade, very strongly bent outwardly, with long acute outward teeth on the median vein and in the submedian interspace. Transverse posterior line brown, often marked only by the contrast between the median darker and the subterminal paler shades, in course slightly sinuate, finely denticulate, with an abrupt and usually long acute inward tooth on vein 11. Subterminal line of the pale ground color, broad, continuous, somewhat diffuse, rather irregularly sinuate, preceded by a brown shade which darkens the outer half of the subterminal space, and additionally emphasized by a series of preceding black spots which sometimes develop into a more prominent mark or shade opposite the hind angle. Apex pale, inferiorly marked by a black oblique streak, which is outwardly diffuse and does not cross the subterminal line. A series of black terminal lunules, preceded by white scales. Fringes alternated with yellow and brown. The median space in the female is brown superiorly, usually also along the transverse posterior line, and sometimes the entire lower part is also more or less marked with this same color. Ordinary spots marked by gray raised scales, and connected by a rather broad black line, which is distinct in all the females seen by me, but tends to become obsolete in the males. A round dot of black raised scales below the median vein in the median space. Secondaries even, pale ochereous or yellowish white, with a brown terminal line. Beneath, dull powdery, with prominent, broad, brown, extra-median lines on all wings, an incomplete subterminal line on primaries, a discal spot on secondaries.

Expanse of wings, 28 to 33 mm. = 1.12 to 1.32 inches.

HABITAT.—California; Vancouver; British Columbia.

This species seems not uncommon locally. Dr. Behr's description is of a most unsatisfactory character and would not have sufficed to distinguish the present species from *H. modesta* without the material in the Hy. Edwards collection, which contained compared specimens.

Besides the characters already enumerated this species is distinguished from both the preceding by the continuous subterminal line, and by the subapical black streak which does not cross this line. In both these characters it agrees with *H. modesta*, than which it is larger and with a different ground color. The distinctive features will be more fully given with the new species.

***Hypena modesta*, new species.**

Ground color luteous gray with bluish gray powderings, giving the insect as a whole a pearly gray appearance. Head and thorax concolorous with the palest color of the primaries. Abdomen paler, of the

color of the secondaries. Primaries in the male almost evenly pearl to fawn gray, the maculation never distinct, often scarcely traceable; in the female the base is a pale grayish luteous more or less marked with brown, and black powdered to the transverse posterior line, beyond which is a bluish gray shade which darkens to brown or smoky before the subterminal line, continuing to the outer margin. The apex is pale, sharply limited inferiorly by a slightly darker tint of the darker wing shade. The usual transverse strigæ are marked on the costal space only. Transverse anterior line slightly paler, broad, diffuse, often barely traceable, outwardly bent, and with two strongly marked teeth, as in *H. californica*. Transverse posterior line usually marked only by the difference in shade between the median and subterminal spaces; sometimes, however, emphasized by a slight reddish suffusion. It is nearly rigidly oblique to the submedian interspace, where it forms an inward tooth on the internal vein. Subterminal line usually continuous, pale, sometimes preceded by black dots, often obsolete or marked only with black dots in the male. A more or less obvious broken terminal line, preceded by paler scales in the interspaces. Ordinary spots marked by elevated scales, which are gray outwardly and black centered. A little tuft of elevated scales in the median space below the cell, and another on the median vein close to base—this latter being more or less evident in all the species. Secondaries a dirty pale yellowish gray, with a more or less marked brown marginal line. Beneath, a dirty gray, powdery, with a rather broad extra median line on all wings, an incomplete subterminal line on primaries, and a discal lunule on secondaries.

Expanse of wings, 24 to 29 mm.=0.96 to 1.16 inches.

HABITAT.—Los Angeles, Cal., April, July, October.

Nine specimens are before me, all of them from the United States National Museum collection, marked "Through C. V. Riley;" some collected by Mr. Coquillett, others by Mr. Koehle. Of the latter, two bear a red number 194, indicating biological notes in the possession of Dr. Riley.

This species has been confused with *H. californica*, with which it agrees in most characters. It is, however, decidedly smaller in the average expanse, and the wings have a modest gray shade, in decided contrast to the distinct bright yellow of its ally, while the ornamentation is never so contrasting. The character of the transverse posterior line is further distinctive, and so are the proportionately longer palpi and more evidently produced angulation of the outer margin.

It is a somewhat interesting fact that on the Pacific Coast there should be four species of *Hyppa*, only one of which extends to the Atlantic Coast, while on the other hand the species of *Bomolocha* are numerous in the East, while none are peculiar to the Pacific Coast.

LIST OF THE GENERA AND SPECIES OF DELTOID MOTHS.

[The names of species recognized in this work are in roman. Synonyms are in italics.]

Tribe HELIINI.

Genus EPIZEUXIS, Hübner.

1. *E. lubricalis*, Geyer.
phualis, Guenée.
surrectalis, Walker.
var. *occidentalis*, Smith.
2. *E. denticularis*, Harvey.
3. *E. rotundalis*, Walker.
borealis, Smith.
forbesii, French.
4. *E. scobialis*, Grote.
5. *E. laurentii*, Smith.
6. *E. americanalis*, Guenée.
scriptipennis, Walker.
7. *E. majoralis*, Smith.
8. *E. amula*, Hübner.
mollifera, Walker.
herminioides, Walker.
effusalis, Walker.
concesa, Walker.

Tribe HERMINIINI.

Genus ZANCLOGNATHA, Lederer.

9. *Z. lituralis*, Hübner.
10. *Z. theralis*, Walker.
deceptricalis, Zeller.
gypsalis, Grote.
11. *Z. minoralis*, Smith.
12. *Z. inconspicualis*, Grote.
13. *Z. lavigata*, Grote.
obsoluta, Smith.
14. *Z. punctiformis*, Smith.
15. *Z. atrilineella*, Grote.
16. *Z. pedipilalis*, Guenée.
17. *Z. cruralis*, Guenée.
jacchusalis, Walker.
18. *Z. obscuripennis*, Grote.
19. *Z. protummosalis*, Walker.
minimalis, Grote.
20. *Z. marcidilinea*, Grote.
21. *Z. ochreipennis*, Grote.

Genus HORMISA, Walker.

22. *H. absorptalis*, Walker.
nubilifascia, Grote.
23. *H. litophora*, Grote.
24. *H. bivittata*, Grote.
25. *H. oreiferalis*, Walker.
pupillaris, Grote.
hartii, French.

Genus PHILOMETRA, Grote.

26. *P. metonalis*, Walker.
gausalis, Walker.
longilabris, Grote.
27. *P. emmelusalis*, Walker.
serraticornis, Grote.

Genus CHYTOLITA, Grote.

28. *C. morbidalis*, Guenée.
29. *C. petrealis*, Grote.

Genus BLEPTINA, Guenée.

30. *B. caradrinalis*, Guenée
cloniasalis, Walker.
31. *B. medialis*, Smith.
32. *B. inferior*, Grote.

Genus TETANOLITA, Grote.

33. *T. mynesalis*, Walker.
liralis, Grote.
34. *T. floridana*, Smith.
35. *T. palligera*, Smith.

Genus RENIA, Guenée.

36. *R. salusalis*, Walker.
brevirostralis, Grote.
37. *R. discoloralis*, Guenée.
fallacialis, Walker.
generalis, Walker.
thraxalis, Walker.
38. *R. fraternalis*, Smith.
39. *R. sobrialis*, Walker.
restrictalis, Grote.
40. *R. larvalis*, Grote.

41. *R. elitosalis*, Walker.
centralis, Grote.
 42. *R. factiosalis*, Walker.
plenilinealis, Grote.
alutalis, Grote.
 43. *R. flavipunctalis*, Geyer.
phalerosalis, Walker.
heliosalis, Walker.
pastoralis, Grote.
belfragci, Grote.
 44. *R. pulverosalis*, Smith.

Genus *HYPENULA*, Grote.

45. *H. eacuminalis*, Walker.
biferalis, Walker.
opaealis, Grote.

Genus *HETEROGRAMMA*, Guenée.

46. *H. pyramusalis*, Walker.
gyasalis, Walker.
rurigena, Grote.

Genus *GABERASA*, Walker.

47. *G. ambigialis*, Walker.
♂ bifidalis, Grote.
♀ indivisalis, Grote.

Genus *DERCETIS*, Grote.

48. *D. vitrea*, Grote.
 49. *D. pygmaea*, Grote.

Genus *PALTIUS*, Hübner.

50. *P. angulalis*, Hübner.
aracanthusalis, Walker.
 51. *P. asopialis*, Guenée.

Tribe *HYPENINI*.

Genus *CAPIS*, Grote.

52. *C. curvata*, Grote.
 Genus *SALIA*, Hübner.
 53. *S. interpuncta*, Grote.
saligna, Zeller.
rufa, Grote.
 54. *S. salicalis*, Fabricius.

Genus *BOMOLOCHA*, Hübner.

55. *B. manalis*, Walker.

56. *B. baltimoralis*, Guenée.
benignalis, Walker.
laciniosa, Zeller.
 57. *B. bijugalis*, Walker.
pullialis, Zeller.
fecialis, Grote.

58. *B. scutellaris*, Grote.
 59. *B. abalinealis*, Walker.
 60. *B. deceptalis*, Walker.
perangulalis, Harvey.
 61. *B. madefactalis*, Guenée.
aehatinalis, Zeller.
damnosalis, Walker.
caduealis, Walker.
profecta, Grote.

62. *B. sordidula*, Grote.
 63. *B. umbralis*, Smith.
 64. *B. toreuta*, Grote.
internalis, || Robinson.
albissignalis, Zeller.
 65. *B. edictalis*, Walker.
♀ vellifera, Grote.
♂ lentiginosa, Grote.
 66. *B. citata*, Grote.
trituberalis, Zeller.
 67. *B. annulalis*, Grote.

Genus *LOMANALTES*, Grote.

68. *L. eductalis*, Walker.
latulus, Grote.

Genus *PLATHYPENA*, Grote.

69. *P. scabra*, Fabricius.
erectalis, Guenée.
palpalis, Haworth.
crassatus, Haworth.
obsalis, Stephens.
subrufalis, Grote.

Genus *HYPENA*, Schrank.

70. *H. humuli*, Harris.
evanidalis, Robinson.
germanalis, Walker.
 var. *olivacea*, Grote.
 var. *albopunctata*, Tepper.
 71. *H. decorata*, Smith.
 72. *H. californica*, Behr.
 73. *H. modesta*, Smith.

EXPLANATION OF PLATES.

PLATE I.

SPECIES OF THE GENUS *EPIZEUXIS*.

- 1-5. *E. lubricalis*.
6. *E. denticulalis*.
- 7-9. *E. rotundalis*.
10. *E. forbesii*: from the type in Professor Forbes' collection.
11. *E. scobialis*.
12. *E. laurentii*: from the male type.
13. *E.* " : from the female type.
- 14-16. *E. americalis*.
- 17, 18. *E. majoralis*: from two of the types.
- 19-21. *E. æmula*.

PLATE II.

SPECIES OF THE GENUS *ZANCLOGNATHA*.

- 1-3. *Zanclognatha lituralis*.
- 4, 5. *Z. theralis*.
6. *Z. minoralis*: from the type in the collection of the Michigan Agricultural College.
- 7, 8. *Z. inconspicualis*.
9. *Z. levigata*: from the female type.
10. *Z.* " : from the male type: both in the collection of the American Entomological Society.
- 11-15. *Z. levigata*: illustrating variation.
16. This figure is missing.
17. *Z. levigata*: showing fore legs with partly expanded tuftings.
18. *Z. atrilineella*: from the type in the collection of the American Entomological Society.

PLATE III.

SPECIES OF THE GENUS *ZANCLOGNATHA*.

1. *Zanclognatha punctiformis*: from the type in the collection of the United States National Museum: somewhat enlarged.
2. *Z. pedipilalis*: somewhat enlarged.
3. *Z.* " : natural size.
- 4-6. *Z. cruralis*.
7. *Z. obscuripennis*: from the type in the collection of the American Entomological Society: somewhat enlarged.
- 8-12. *Z. protummosalis*.
13. *Z. protummosalis*: somewhat enlarged.
14. *Z. marcidilinea*: somewhat enlarged.
15. *Z.* " : from the type in the collection of the American Entomological Society: somewhat enlarged.
16. *Z. marcidilinea*: from typical specimens in the collection of the American Entomological Society: slightly enlarged.

17, 18. *Z. ochreipennis*: from two of the types in the collection of the American Entomological Society.

19-21. *Z. ochreipennis*: all somewhat enlarged.

PLATE IV.

SPECIES OF THE GENERA *HORMISA*, *PHILOMETRA*, *CHYTOLITA*, AND *TETANOLITA*.

1, 2. *Hormisa absorptalis*

3. *H. litophora*.

4. *H. bivittata*.

5. *H. oreiferalis*.

6. *H.* " : from the type of *Pallachira hartii* in the collection of S. A. Forbes.

7, 8. *Philometra metonalis*.

9, 10. *P. eumelusalis*.

11, 12. *Chytolita morbidalis*.

13-15. *C. petrealis*.

16-18. *Tetanolita mynesalis*.

19-21. *T. floridana*: from the types in the collection of the United States National Museum.

22-24. *T. palligera*.

All the figures are slightly enlarged.

PLATE V.

SPECIES OF THE GENERA *BLEPTINA*, *HETEROGRAMMA*, *GABERASA*, *DERCETIS*, AND *PALTHIS*.

1-5. *Bleptina caradrinalis*: all somewhat enlarged.

6-7. *B. medialis*: from the types.

8. *B. inferior*.

9. *B.* " : from the type in the collection of the American Entomological Society: a little enlarged.

10, 11. *Heterogramma pyramusalis*.

12. *Gaberasa ambignalis*: male.

13. " " : male: much enlarged.

14-15. " " : female.

16. " " : female: much enlarged.

17. *Dercetis vitrea*.

18. " *pygmaea*.

19. *Palthis angulalis*: female.

20. " " : male.

21-22. " " : female: both much enlarged.

23. " *asopialis*: male.

24. " " : same, much enlarged.

25. " " : female.

PLATE VI.

SPECIES OF THE GENUS *RENIA*.

1. *R. salusalis*: male: a little enlarged.

2, 3. *R.* " : male: from types of *R. brevisrostralis* in the collection of the American Entomological Society: somewhat enlarged.

4, 8. *R. discoloralis*: showing variations.

9, 10. *R. fraternalis*: from types in the collection of the United States National Museum.

11. *R. factiosalis*.

12-14. *R.* " from types of *R. plenilincalis* in the collection of the American Entomological Society.

15-17. *R. factiosalis*.

PLATE VII.

SPECIES OF THE GENUS *RENIA*.

1. *R. sobrialis*, from the type of *R. restrictalis* in the collection of the American Entomological Society: a little enlarged.
- 2-4. *R. sobrialis*.
- 5, 6. *R. larvalis*, from the types in the collection of the American Entomological Society: a little enlarged.
7. *R. larvalis*.
8. *R. clitosalis*.
9. *R. flavipunctalis*: from the type of *R. belfragei* in the collection of the American Entomological Society.
- 10-14. *R. flavipunctalis*.
- 15, 16. *R. flavipunctalis*: considerably enlarged.
- 17, 18. *R. pulverosalis*: from the types in the collection of the United States National Museum: somewhat enlarged.
19. *R. larvalis*.

PLATE VIII.

SPECIES OF THE GENERA *HYPENULA*, *CAPIS*, *SALIA*, *LOMANALTES*, AND *BOMOLOCHA*.

- 1, 2. *Hypenula cacuminalis*.
3. *Capis curvata*.
4. *Salia salicalis*.
- 5-7. *Lomanaltes eductalis*.
8. *Bomolocha manalis*: female.
9. " " : male.
10. " *baltimoralis*: male.
11. " " : female.
12. " *scutellaris*: female.
13. " *bijugalis*: female.
14. " " : male.
15. " *scutellaris*: male.
16. " *abalinealis*: female.
17. " " : male.
18. " *deceptalis*: male.
19. " " : female.
20. " *umbralis*.
21. " *torenta*.

PLATE IX.

SPECIES OF THE GENERA *BOMOLOCHA*, *PLATHYPENA*, AND *HYPENA*.

- 1, 2. *Bomolocha madefactalis*: female.
3. " " : male.
4. " *sordidula*: male.
- 5, 6. " " : female.
7. " *edictalis*: male.
8. " " : female.
9. " *citata*.
10. *Plathypena seabra*: male.
- 11, 12. " " : female.
13. *Hypena humuli*, var *albopunctata*.
14. " " : male.
15. " " : female.
16. " *decorata*: male.
17. " *californica*: male.
18. " " : female.
- 19-21. " *modesta*: from types in the collection of the United States National Museum.

PLATE X.

STRUCTURAL CHARACTERS OF HELIINI AND HERMINIINI.

1. *Epizexis lubricalis*: antenna of male from side near base and near tip.
2. " : antenna of female.
3. " : fore leg of male in all species.
4. " : venation. This is the usual type in all *Herminiini*.
5. " *denticulatus*: antenna of male from below, near base.
6. " : same from side near tip.
7. " : a single joint, greatly enlarged.
8. " *laurentii*: antenna of male toward middle, from below.
9. " : antenna of female toward tip; *E. annula*, female, is very similar.
10. " *rotundalis*: antenna of male toward base.
11. " : same toward tip.
12. " : antenna of female: that of *americanis* is practically the same.
13. " *scobialis*: antenna of male near base.
14. " : same near tip.
15. " : antenna of female.
16. " *annula*: antenna of male near tip.
17. " : same near base.
18. " *americanis*: antenna of male near middle.
19. " *lubricalis*: palpus.
20. *Zanclognatha lituralis*: fore leg of male.
21. " : specialized joints of male antenna.
22. " : male antenna near tip. *Chytolita mordidalis* is practically like this at the same point.
23. " : antenna of female.
24. " *theralis*: fore leg of male.
25. " : specialized joints of male antenna.
26. " : male antenna near tip.
27. " : antenna of female.
28. " *minoralis*: fore leg of male.
29. " : specialized joints of male antenna: toward tip it is much as in *theralis*.

PLATE XI.

STRUCTURAL CHARACTERS OF HERMINIINI.

1. *Zanclognatha levigata*: fore leg of male.
2. " : specialized joints of male antenna: exceptional form.
3. " : same: usual form.
4. " *punctiformis*: fore leg of male.
5. " : specialized joints of male antenna.
6. " *pedipilalis*: fore leg of male: *obscuripennis*, *ochreipennis*, *minimalis*, and *marcidilinea* are essentially the same.
7. " : specialized joints of male antenna.
8. " : male antenna near tip.
9. " *cruralis*: fore leg of male.
10. " : male antenna at middle.
11. " : specialized joints, further enlarged.
12. " *marcidilinea*: specialized joints of male antenna
13. " *ochreipennis*: " " " " "
14. " *minimalis*: " " " " "
15. " *obscuripennis*: " " " " "
16. " : antenna of female.

PLATE XII.

STRUCTURAL CHARACTERS OF HERMININI.

1. *Philometra eumelusalis*: fore leg of male.
2. " " : male antenna.
3. " *metonalis*: fore leg of male.
4. " " : male antenna. These figures are drawn to the same scale and the differences in size between the two species are proportionally correct.
5. *Philometra metonalis*: tip of a single pectination of male antenna, very much enlarged.
6. *Hormisa absorptalis*: fore leg of male. The other species of this genus are similar.
7. " " : specialized joints of male antenna.
8. " " : a single joint near base.
9. " *litophora*: specialized joint of male antenna.
10. " *oreiferalis*: " " " " " "
11. *Chytolita morbidalis*: fore leg of male. That of *petrealis* is similar, but only half the size.
12. " " : specialized joints of male antenna.
13. " *petrealis*: " " " " " "
14. *Bleptina caradrinalis*: antenna of male.
15. " *medialis*: " " "
16. " *inferior*: " " "

PLATE XIII.

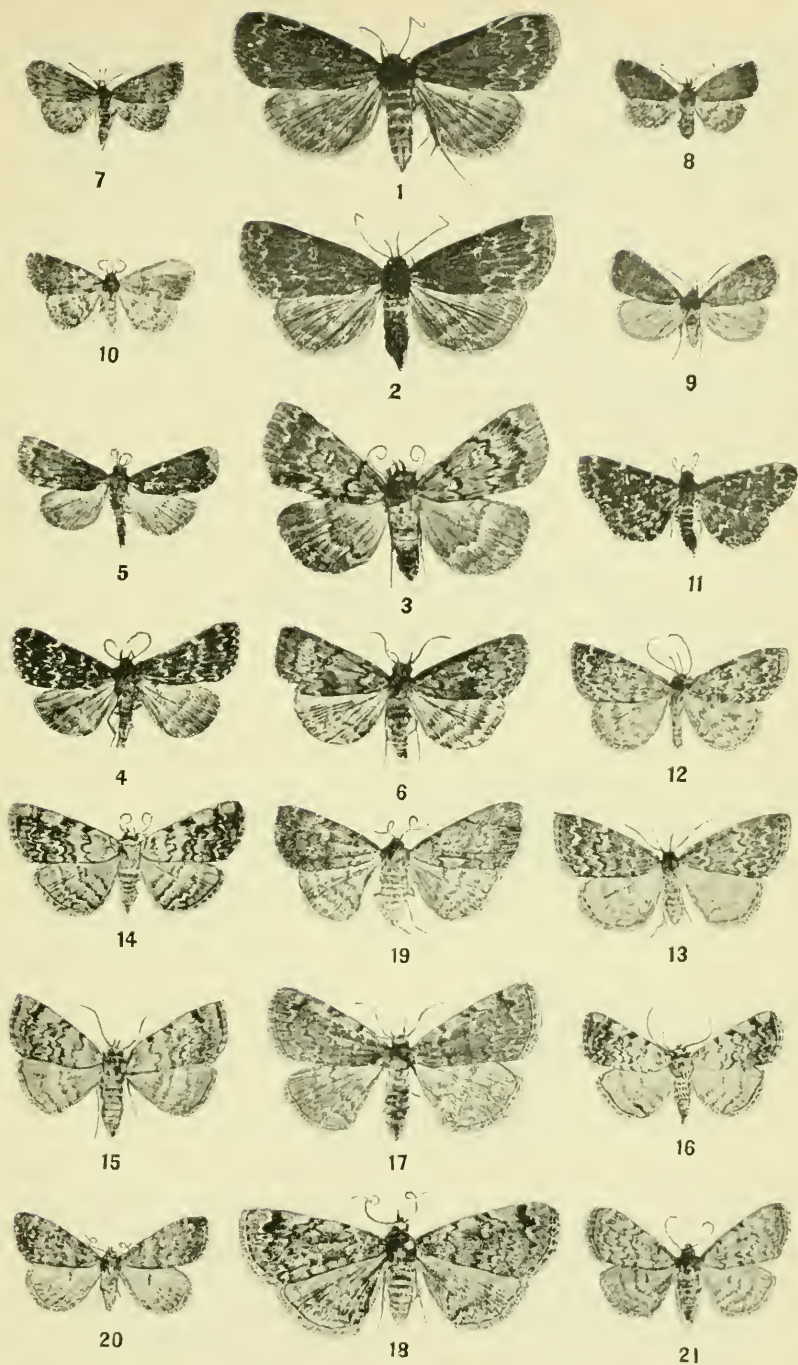
STRUCTURAL CHARACTERS OF HERMININI.

1. *Bleptina caradrinalis*: fore leg of male. *Medialis* and *inferior* are practically the same.
2. " " : venation of both wings.
3. *Tetanolita floridana*: fore leg of male. *Palligera* is essentially like this.
4. " " : antenna of male toward tip: toward base it is much as in *licalis*.
5. " *mynesalis*: fore leg of male.
6. " " : specialized portion of male antenna.
7. " " : venation of primary at end of subcostal.
8. " *palligera*: specialized part of male antenna.
9. *Hypenula cacuminalis*: fore leg of male.
10. " " : antenna of male toward tip.
11. *Heterogramma pyramusalis*: fore leg of male.
12. " " : antenna of male.
13. Characteristic antenna of *Renia*.
14. Venation of primaries in *Renia*.
15. *Renia salusalis*: foreleg of male.
16. " *flavipunctalis*: foreleg of male: all the species are like one or the other of the forms here figured.
17. " *salusalis*: specialized joints of male antenna. The hair tuft omitted in all these figures. *Discoloralis* is very similar.
18. " *sobrialis*: specialized joints of male antenna.
19. " *larvalis*: " " " " " "
20. " *elitosalis*: " " " " " "
21. " *flavipunctalis*: " " " " " "
22. " *pulverosalis*: " " " " " " *Factiosalis* is practically like this.
23. Palpus of *Renia*.

PLATE XIV.

STRUCTURAL CHARACTERS OF HERMINIINI AND HYPENINI.

1. *Gaberasa ambigua*: venation of primary of male.
2. " " : palpus of male.
3. " " : fore leg of male.
4. *Dereetis*: venation of both wings.
5. " : male palpus.
6. " vitrea: fore leg of male.
7. " " : antenna of male.
8. " pygmaea: fore leg of male.
9. " " : antenna of male.
10. Venation of primaries in *Palthis*.
11. *Palthis asopialis*: fore leg of male.
12. " " : palpus of male.
13. " " : antenna of male. *Gaberasa* is also like this.
14. " " : palpus of female.
15. " " : specialized guarded pits of male palpi, from which the hair tufts issue. The structure in *angulalis* is essentially the same but smaller throughout.
16. Venation of *Bomolocha*; and this is essentially the same in all Hypenids.
17. Fore leg of the male Hypenini.
18. Antenna of male in the Hypenini.
19. Palpus of *Bomolocha*.



SPECIES OF THE GENUS *EPIZEUXIS*.
(For explanation of plate see page 121.)



11



12



7



17



2



4



9



3



6



1



10



5



18



13



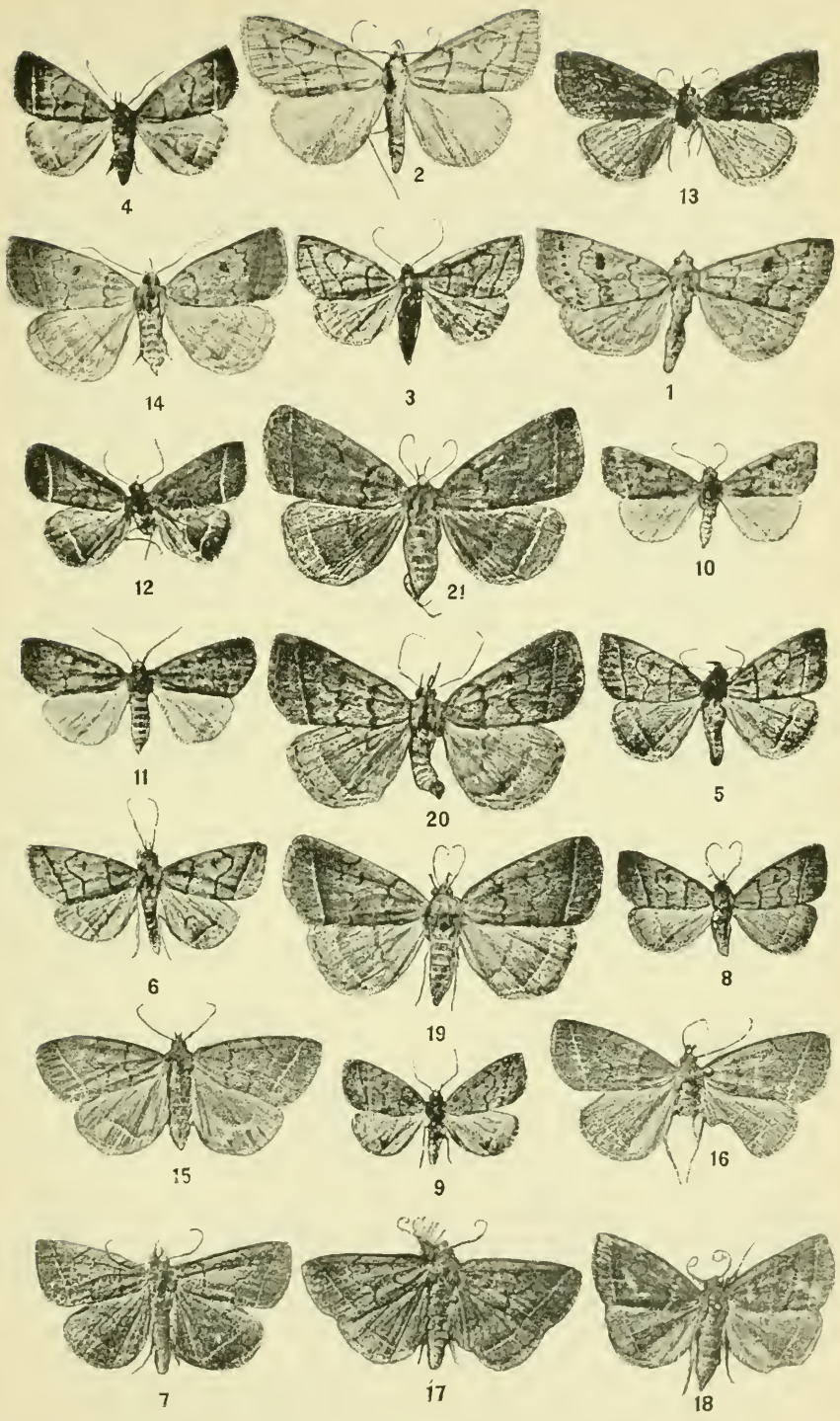
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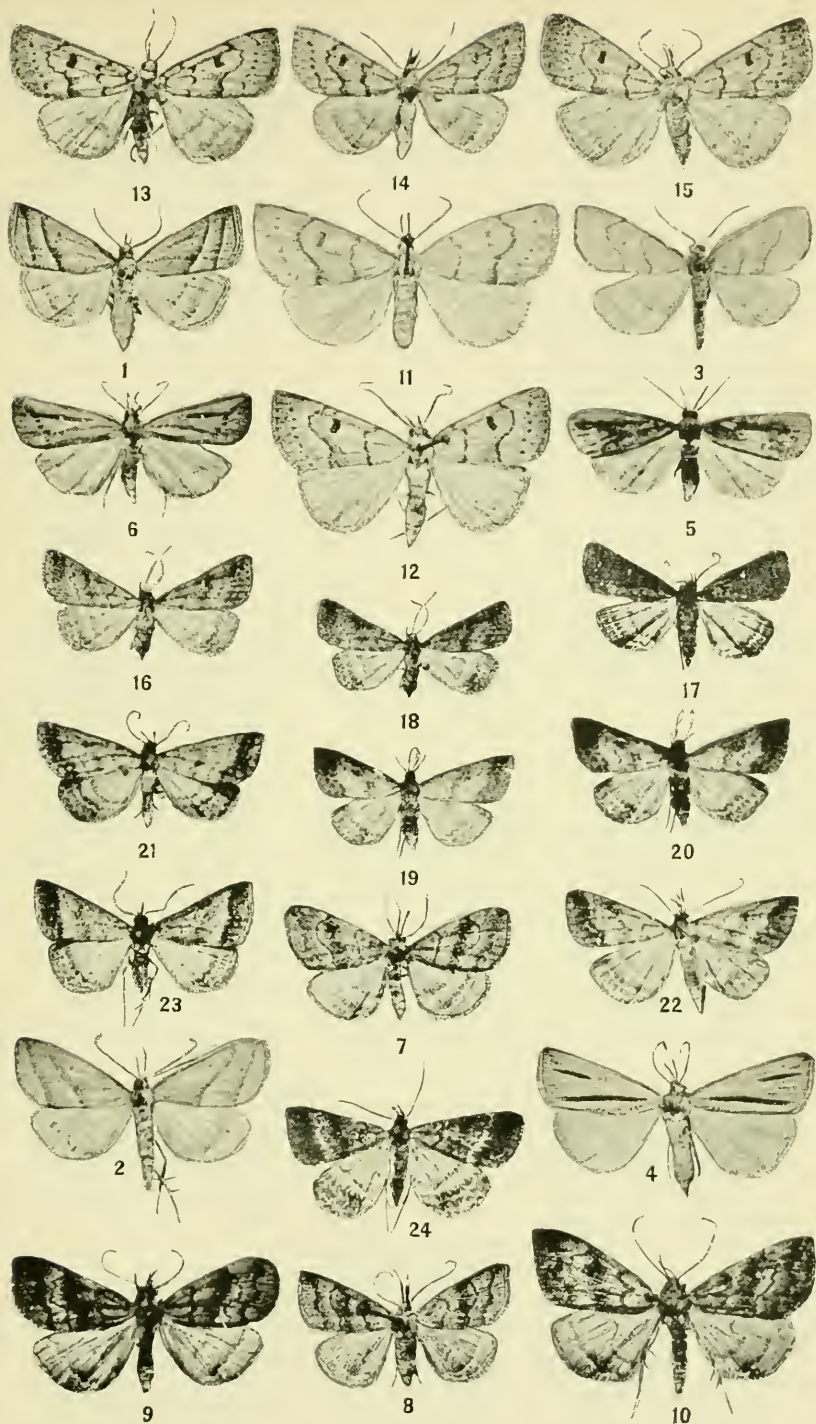
14



15



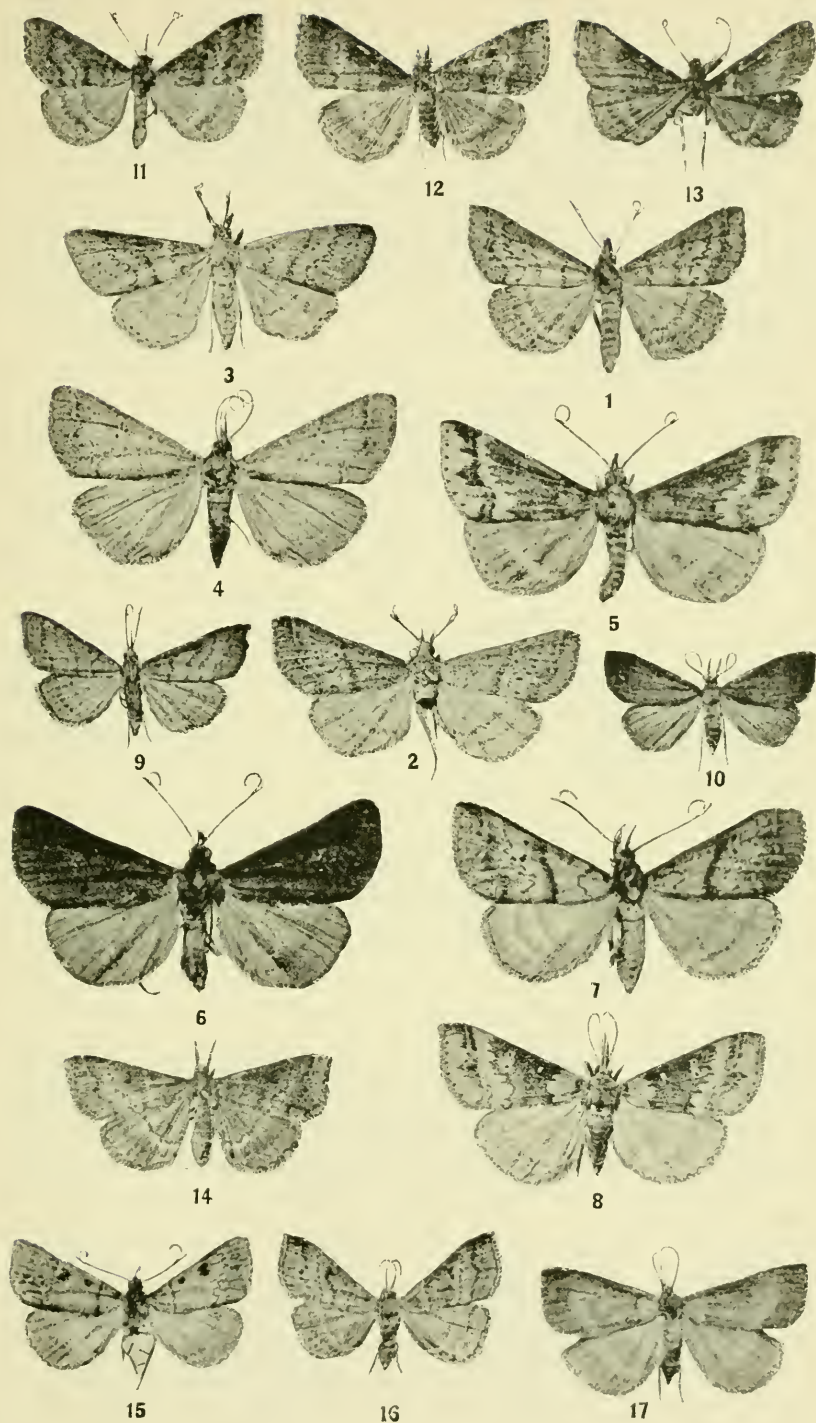
SPECIES OF THE GENUS ZANCLOGNATHA.
(For explanation of plate see page 121.)



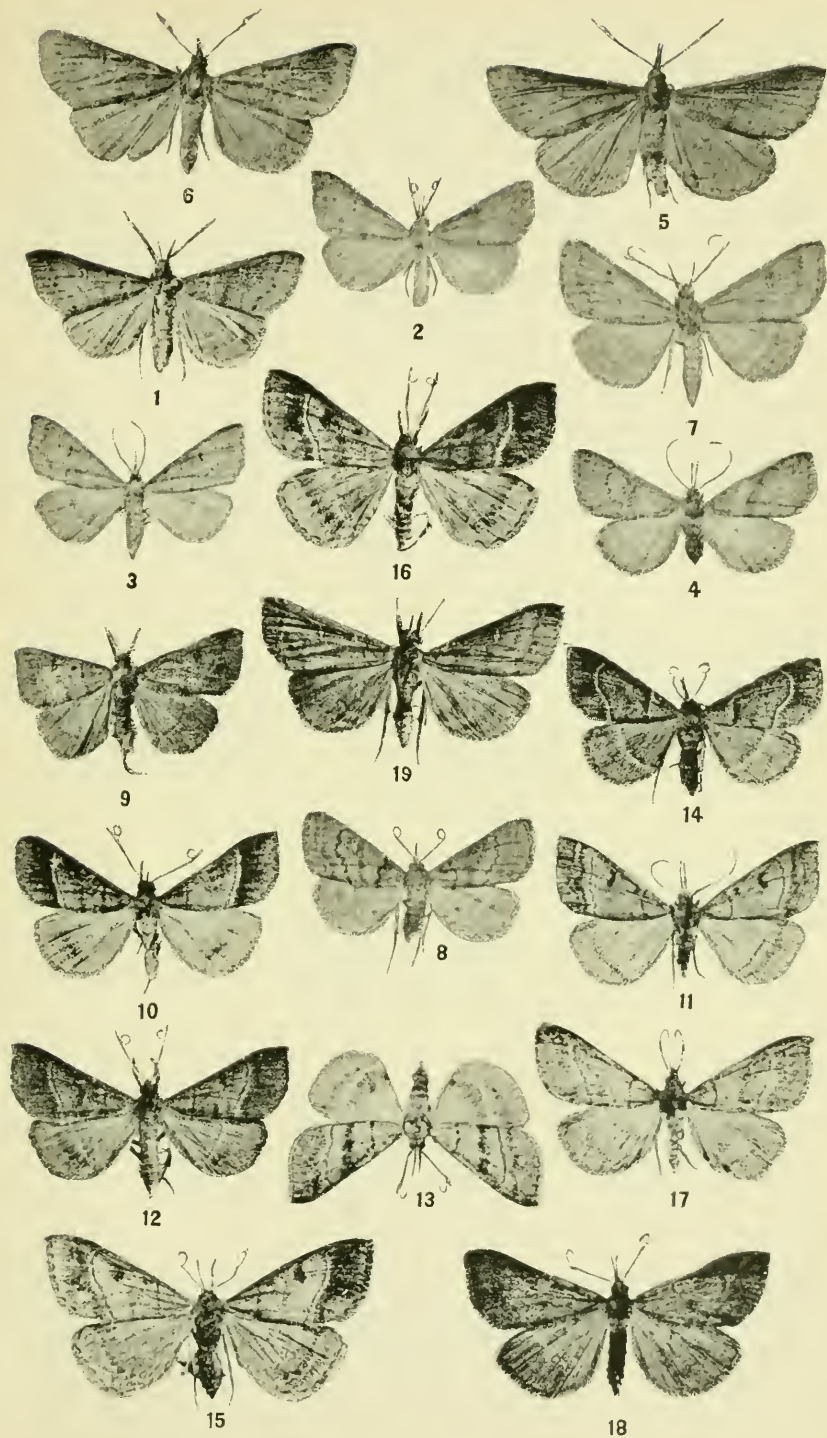
SPECIES OF *HORMISA*, *PHILOMETRA*, *CHYTOLITA*, AND *TETANOLITA*.
(For explanation of plate see page 122.)



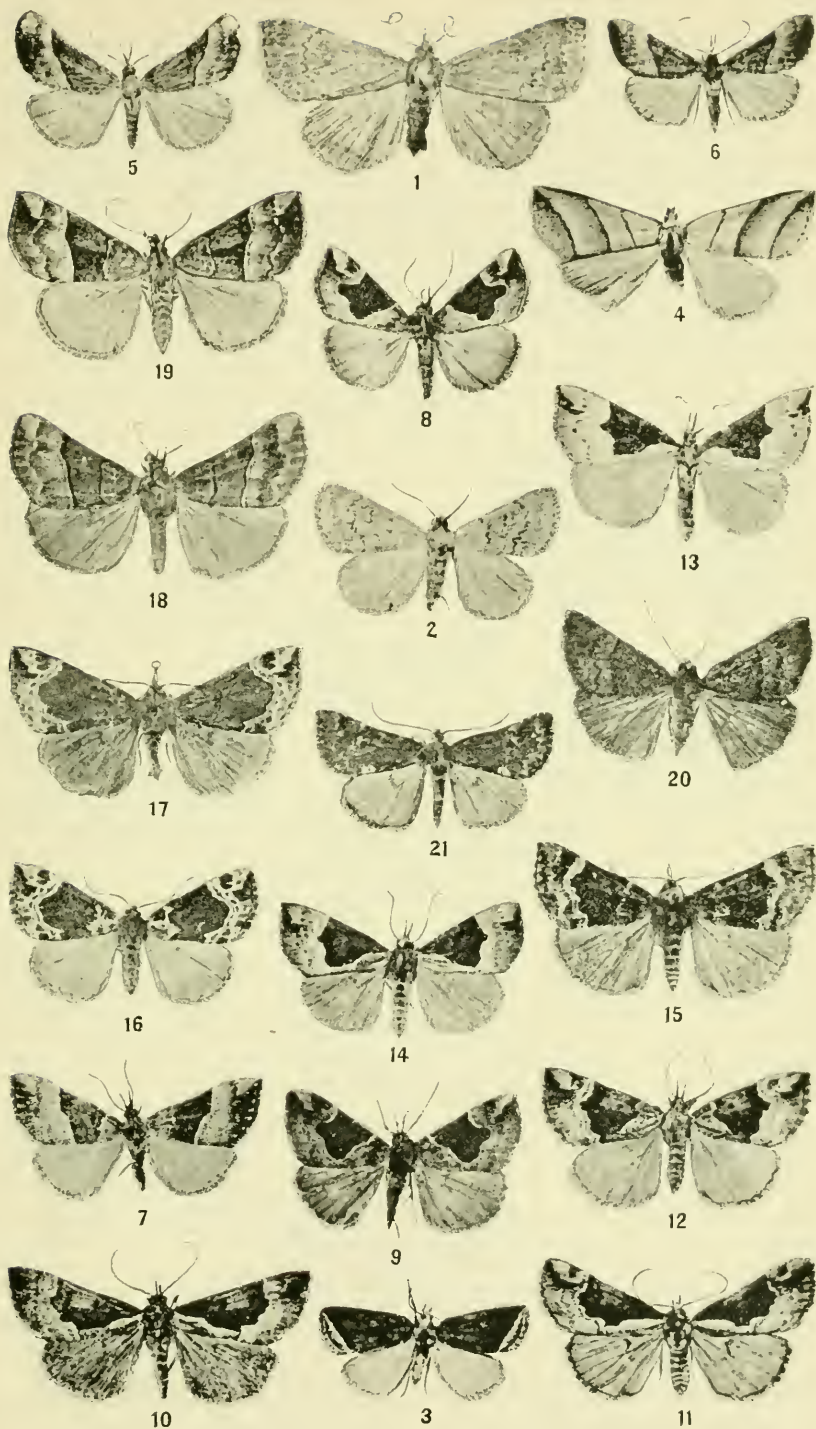
SPECIES OF BLEPTINA, HETEROGRAMMA, GABERASSA, DERCETIS, AND PALTHIS.
(For explanation of plate see page 122.)



SPECIES OF THE GENUS *RENIA*.
(For explanation of plate see page 122.)

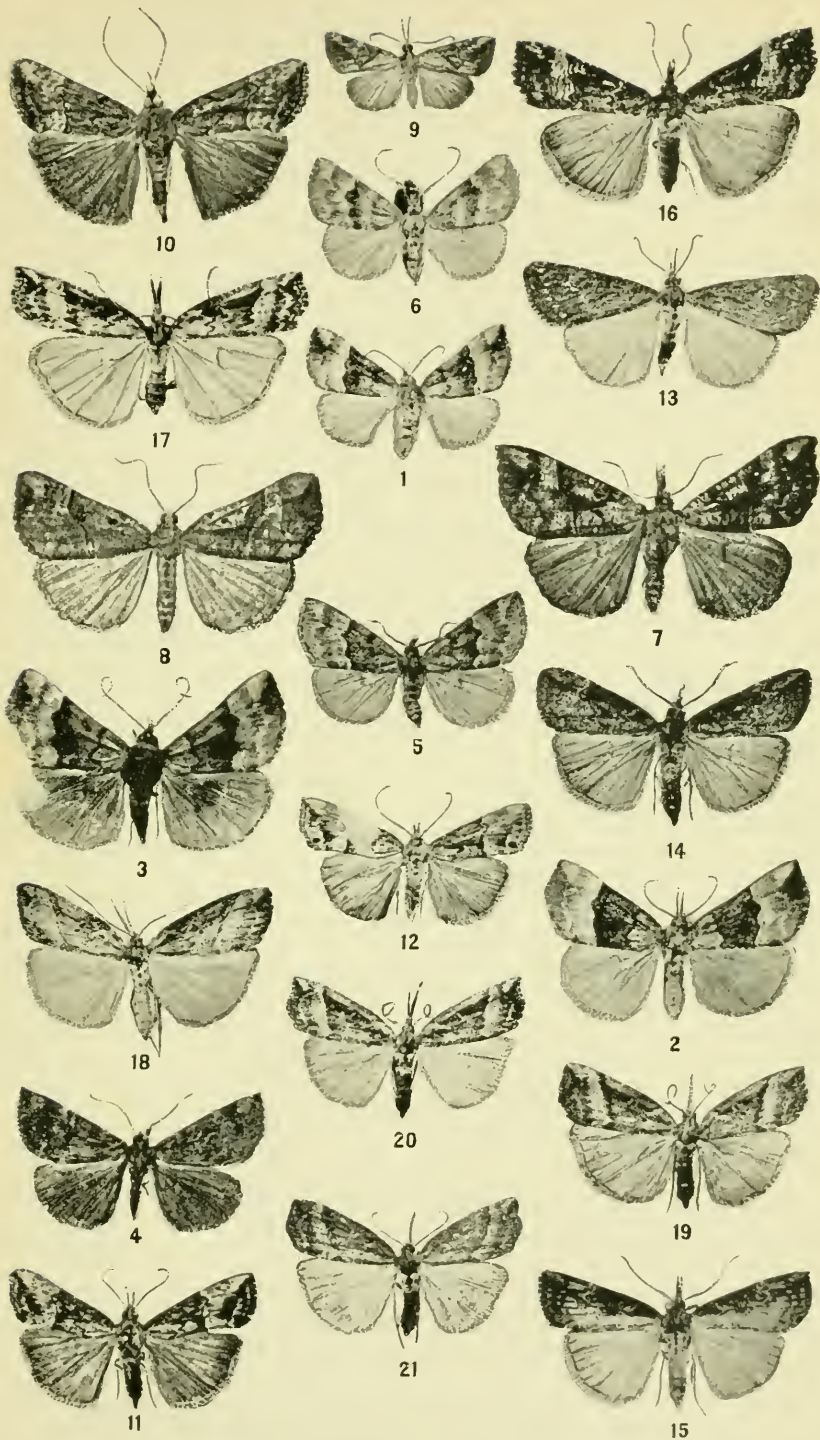


SPECIES OF THE GENUS *RENIA*.
(For explanation of plate see page 123.)

SPECIES OF *HYPENULA*, *CAPIS*, *SALIA*, *LOMANALTES*, AND *BOMOLOCHA*.

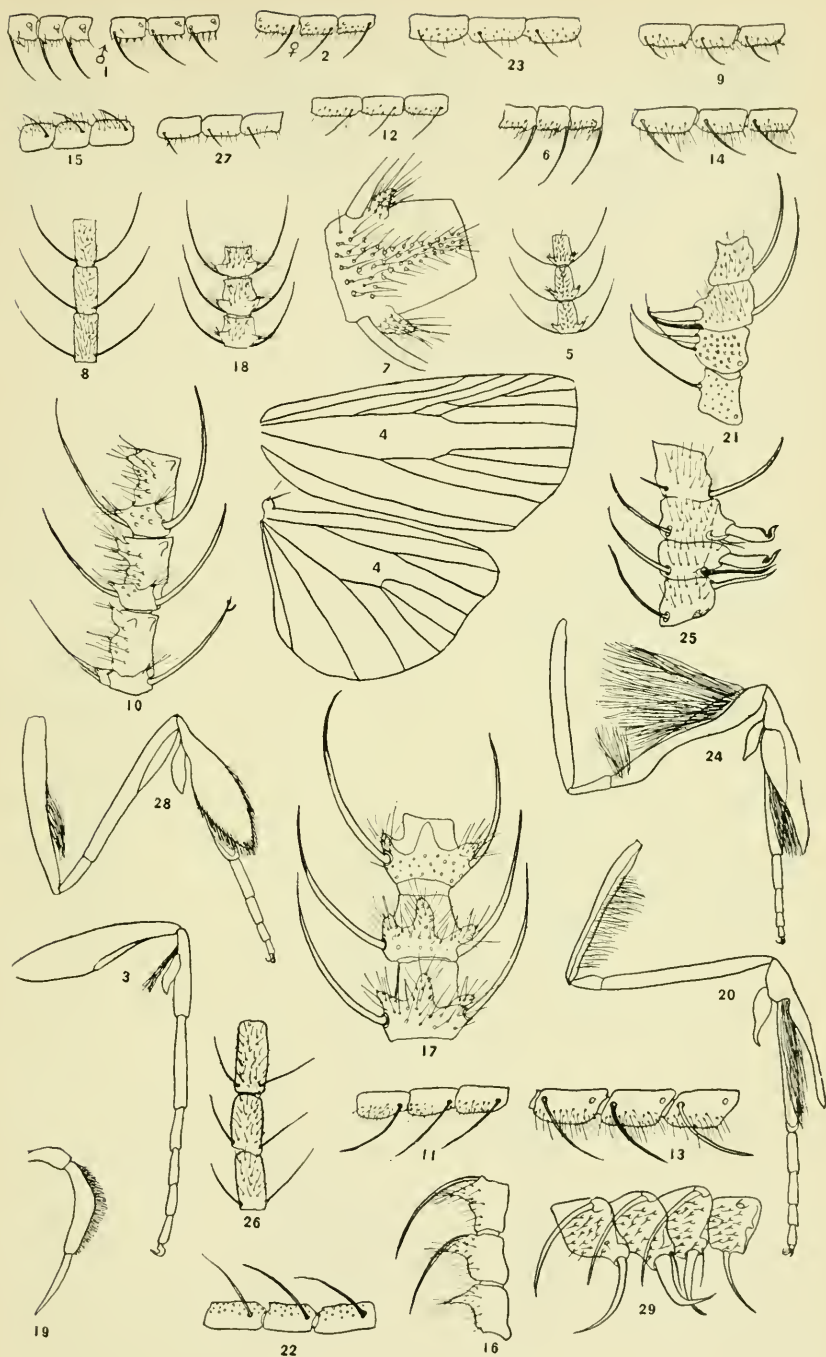
(For explanation of plate see page 133.)





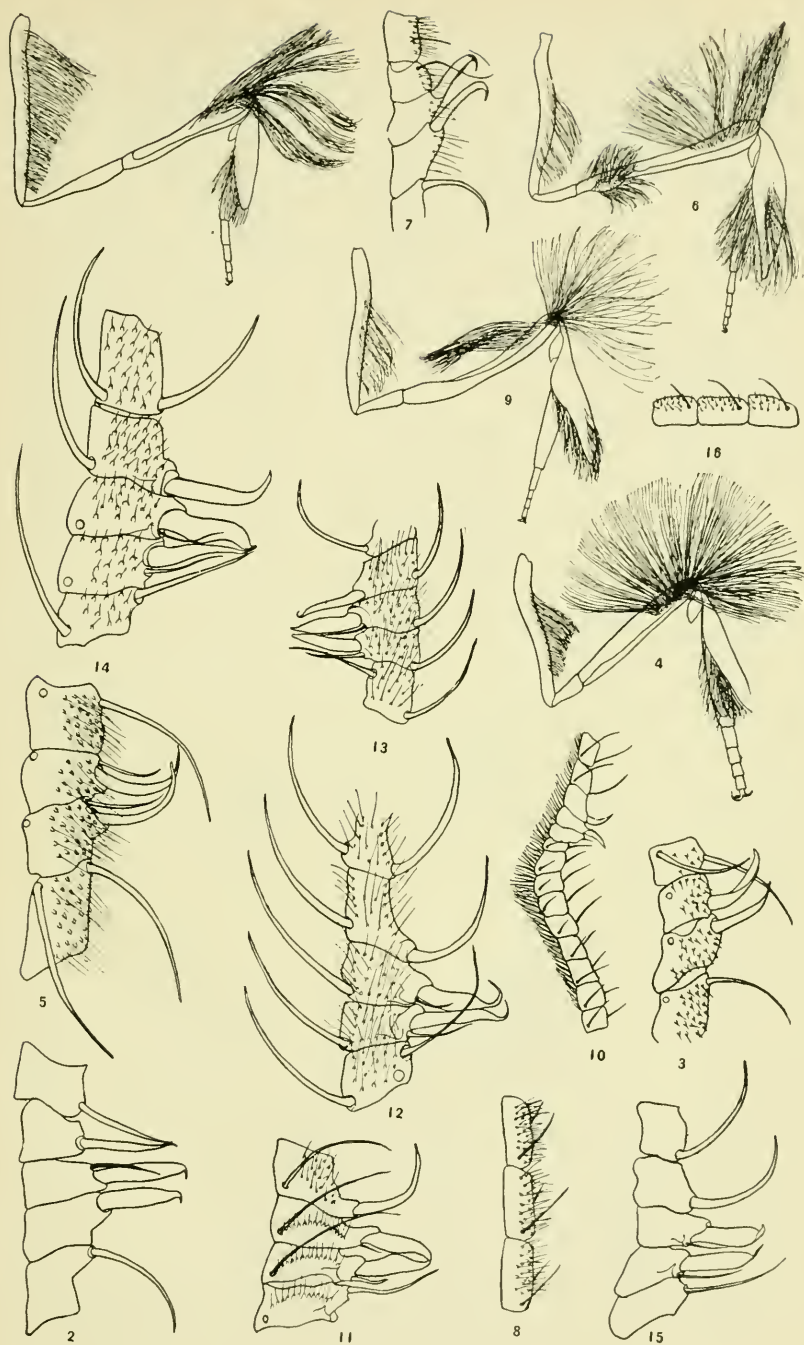
SPECIES OF BOMOLOCHA, PLATHYPENA, AND HYPENA.

(For explanation of plate see page 123.)

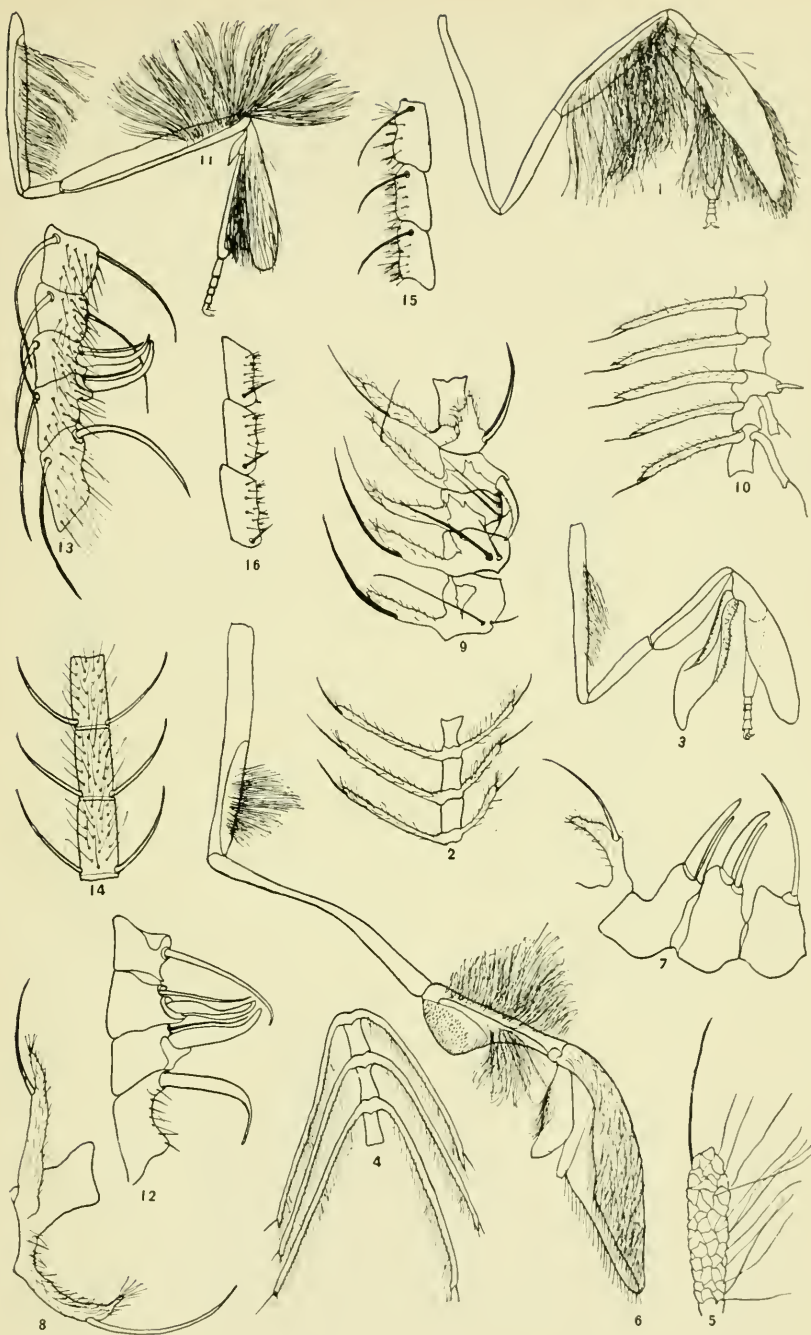


STRUCTURAL CHARACTERS OF HELIINI AND HERMINIINI.

(For explanation of plate see page 124.)

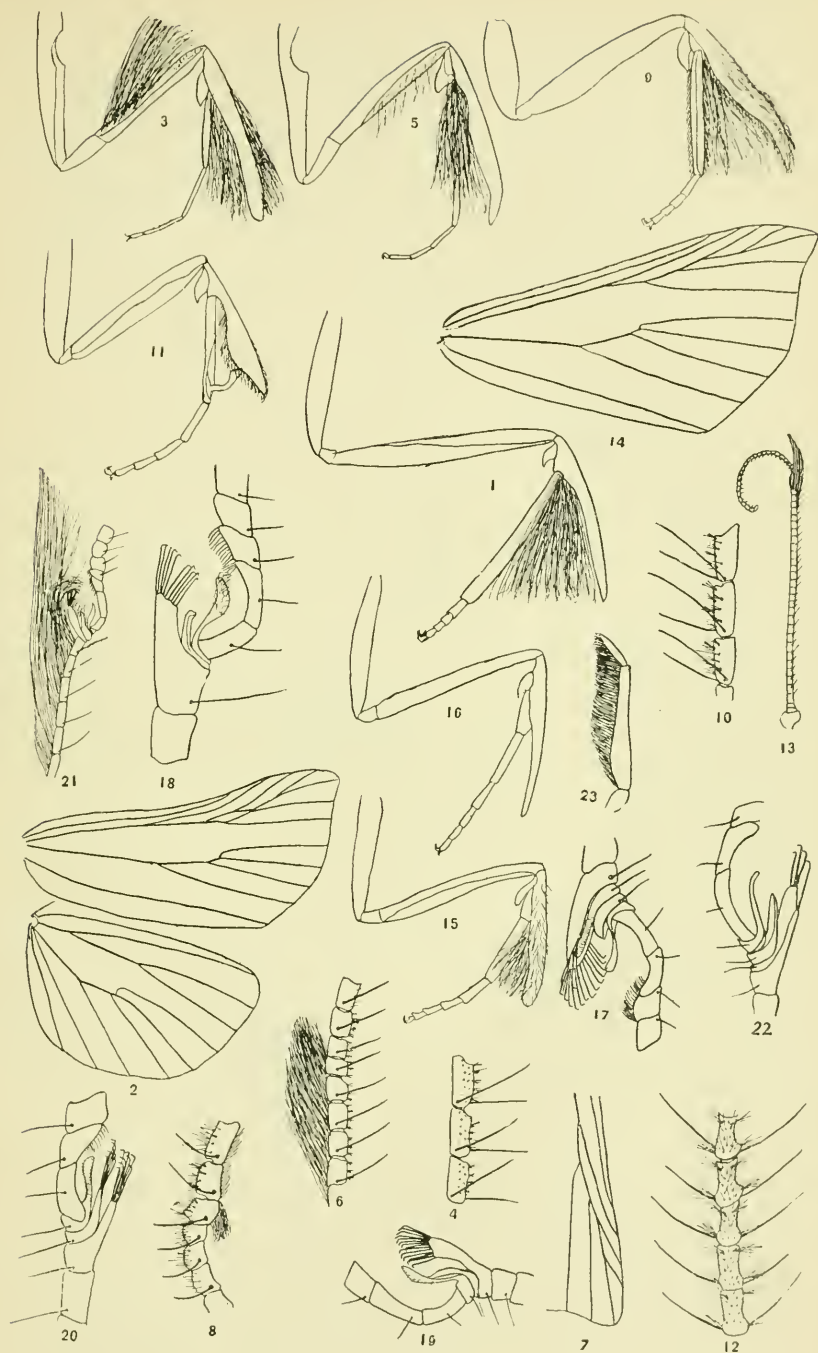


STRUCTURAL CHARACTERS OF HERMINIINI.
(For explanation of plate see page 124.)

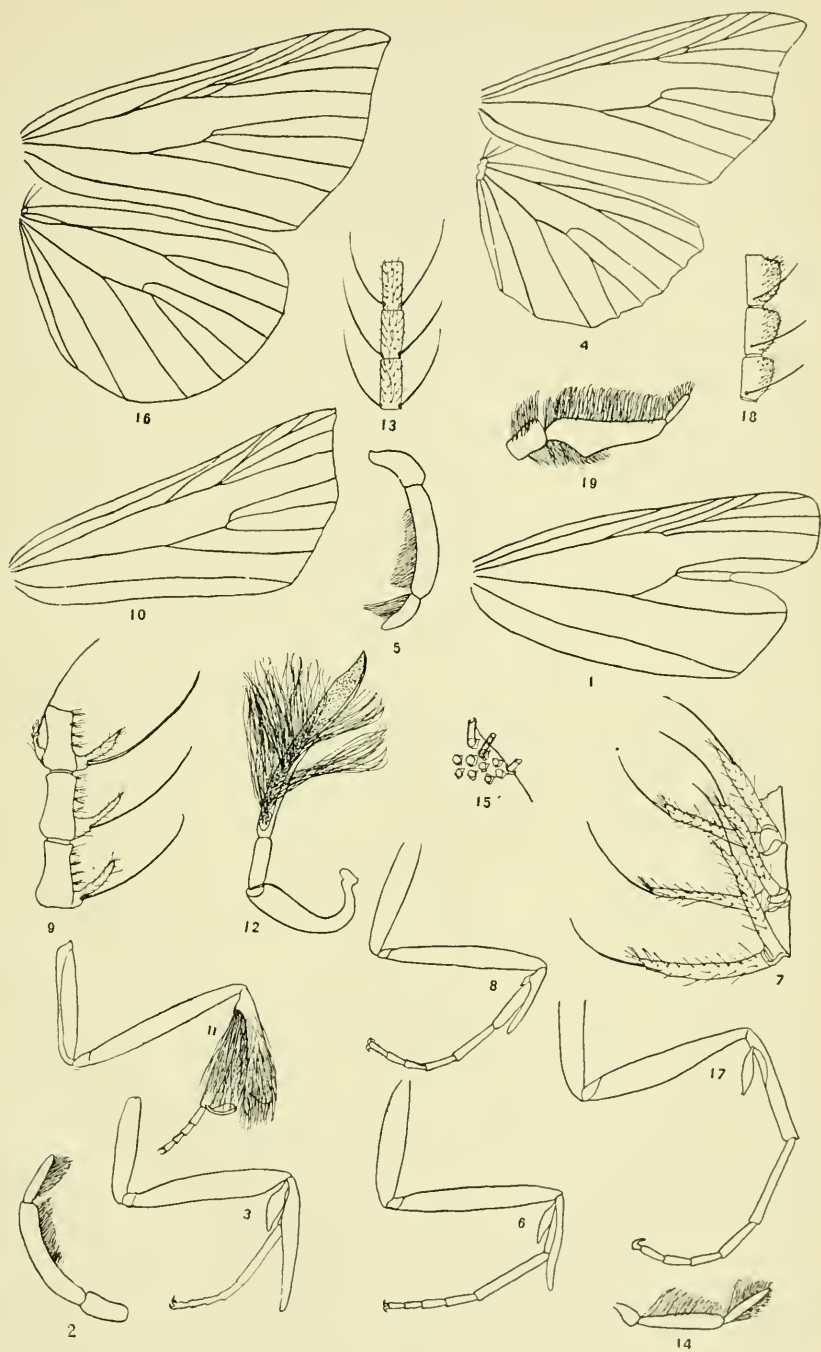


STRUCTURAL CHARACTERS OF HERMINIINI.

(For explanation of plate see page 125.)



STRUCTURAL CHARACTERS OF HERMINIINI.
(For explanation of plate see page 125.)



STRUCTURAL CHARACTERS OF HERMINIINI AND HYPENINI.

(For explanation of plate see page 126.)

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[Tribal and Family names are in capitals. Generic names begin with capitals, and specific names with lower-case letters. Synonyms are printed in *italics*.]

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OF THE DELTOID MOTHS.

BY

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